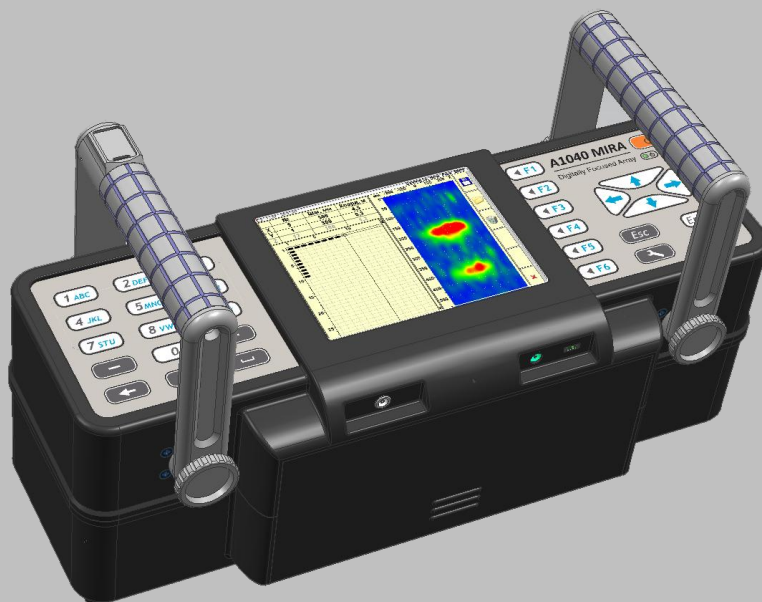




ULTRASONIC LOW-FREQUENCY TOMOGRAPH

A1040 MIRA **OPERATION MANUAL**



Acoustic Control Systems
Moscow 2010

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The present operation manual (further under the text - a manual) contains technical characteristics, the description of the device and an action principle, and also the data necessary for correct operation of Low-frequency ultrasonic tomograph A1040 MIRA (further under the text – tomograph or the device).

Before the beginning of device operation it is necessary to study the present manual attentively.

The permanent job over perfection of possibilities, increase of reliability and convenience of operation can sometimes lead to some not principal changes which are not reflected in the present edition of a manual, not worsening device technical characteristics.

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1 THE GENERAL INSTRUCTIONS

1.1 DEVICE PURPOSE

1.1.1 Purpose and field of using

Low-frequency ultrasonic tomograph A1040 MIRA It is intended for inspection of monolithic concrete and steel-concrete building designs for the purpose of search of emptiness, channels, rebars, foreign impurities, stratifications, cracks and other cavities, both empty and filled with a liquid or solid material different from surrounding concrete by physico-mechanical properties.

The device is intended for the control of objects from concrete, reinforced and a stone at one side access to them for the purpose of integrity definition of a material in a design, search of foreign impurities, cavities, ensilages, stratifications and cracks, and also measurement of an object of the control thickness.

The device allows quickly and effectively survey extensive objects with full documenting of results and possibility of their preliminary analysis.

The device can work as a part of the automatic installations and for the manual control.

The basic device's field of using:

- Inspection of under construction and maintained steel-concrete buildings, constructions, bridges, tunnels, highways, airdromes about integrity and reliability;
- Definitions of concrete quality, thickness of walls and overlapping;
- Search in concrete constructions of emptiness, channels, rebars, definition of its thickness and a step;
- Inspection of an inaccessible surfaces of concrete walls condition, rough estimate of the adjoining environment (air, ground, water);
- Estimation of extracted in mining industry minerals quality.

1.1.2 Service conditions

The device is intended for operation under following environment conditions:

- Temperature from -10 to + 50 ° C.

1.2 TECHNICAL CHARACTERISTICS

The device's basic technical characteristics are reviewed in the table1.

T a b l e 1

Parameter's name	Value
Minimal thickness of testing object, mm	50
Maximum thickness of testing object, mm	2500
Operating frequency, kHz	25 - 85
Range of working frequency changing, kHz	25 - 80
Weight without the handle, Kg, no more	4,5
Overall dimensions without the handle, mm	380×130×140
Charging	Built in accumulator / alternating current network
Operating time from the accumulator, h	5

1.3 DEVICE AND IT'S WORK

1.3.1 Design of the device

Tomograph A1040 MIRA is made in the form of a monoblock with the demountable handle (Fig. 1), which includes the built in computer and antenna array.



Fig. 1

The button "Start" (trigger) is built in the handle. It is intended for start of signal sending procedure.

On the facial panel of the device there are: big display, the keyboard and two light-emitting diode indicators (Fig. 2).

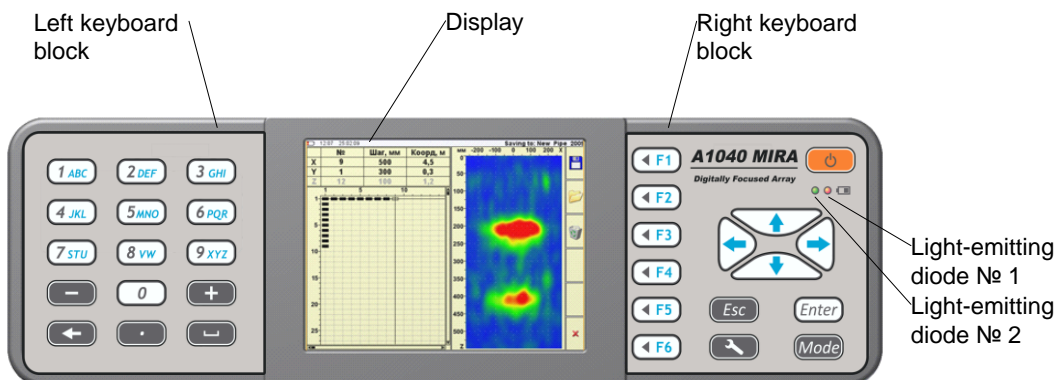


Fig. 2

Light-emitting diode №1 lights up with green color after device switching on.

The light-emitting diode № 2 lights with orange color in process of the accumulator charging, after charging termination it changes color for green.

The review of the bottom facial side of device with the removed accumulator is shown on Fig. 3.

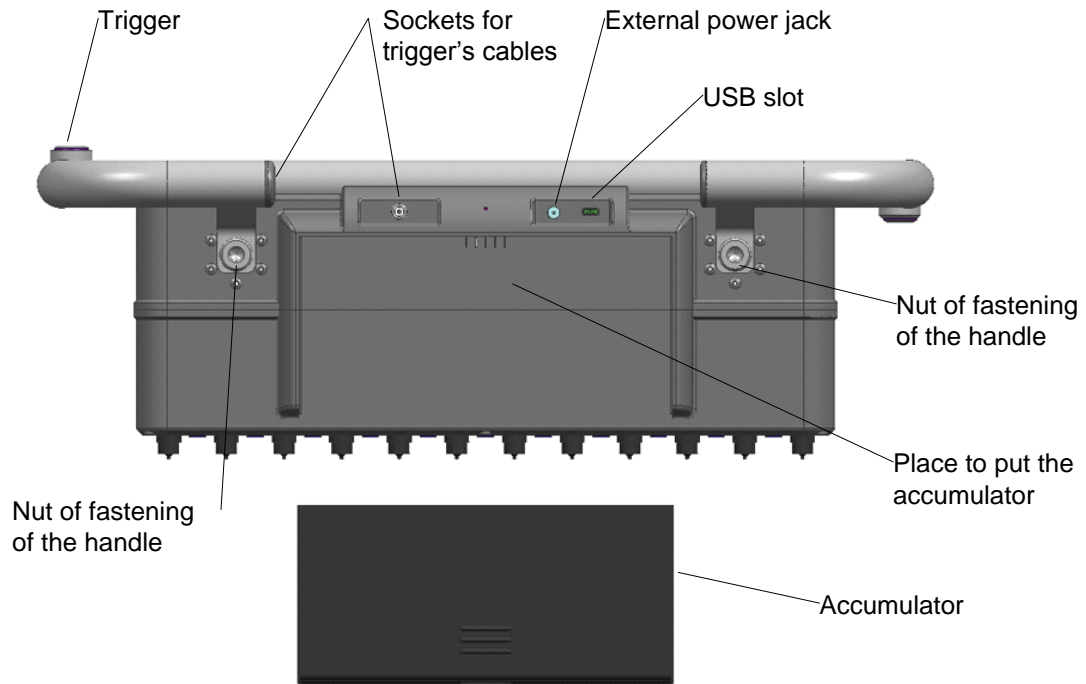


Fig.3

The back side of a tomograph is matrix antenna array made from 48 (12 blocks of 4 elements in each) low-frequency broadband transducers of Shear waves with dry point contact and ceramic wearproof pins (Fig. 4).

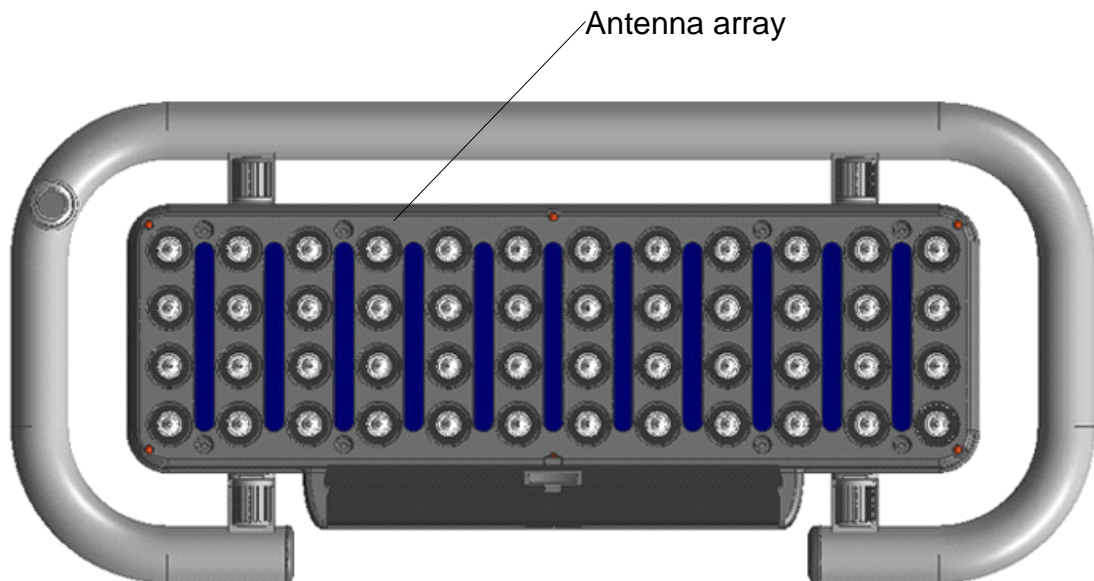


Fig. 3

As the antenna array consists of dry point contact transducers, the inspection is conducted without any couplant.

The method of the synthesizing focused aperture used for gathering and data processing provides a bright and clear graphic representation for the analysis of internal structure.

1.3.2 Device's display

In all operating modes in the top information line of the display there is an information about flowing time and date, and also about the condition of accumulator. At the right the vertical strip of pictograms is located. Their appointment varies depending on a device operating mode.

Other information represented on the screen is defined by the chosen mode.

The screen type in the REVIEW mode with A-scan is shown in Fig. 5.

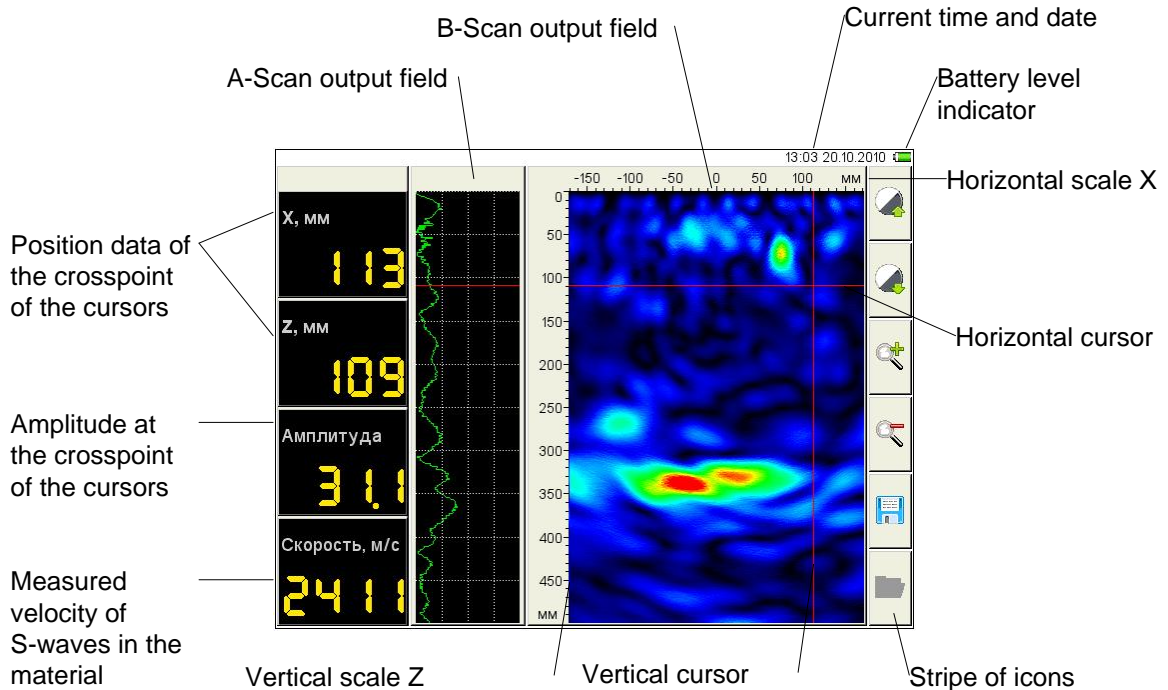


Fig. 4

1.3.3 The device keyboard

The operating keyboard consists of two blocks located at the left and at the right of the display.

The left block of the keyboard (Fig. 6) includes the expanded alphanumeric block.

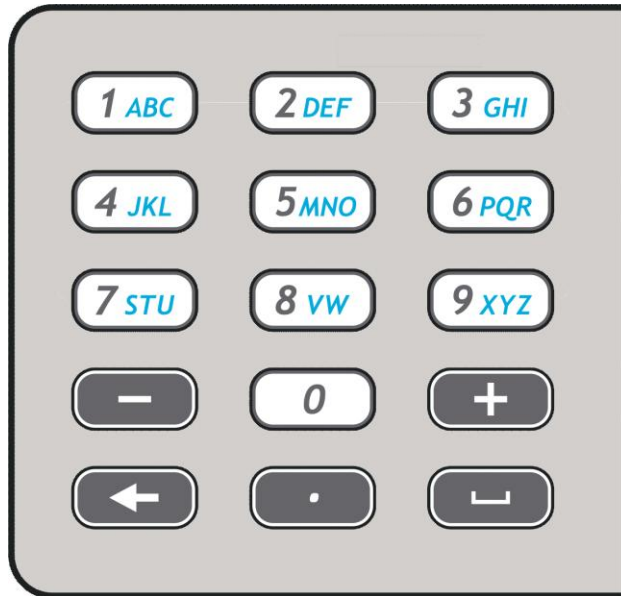









Fig. 5

The basic functions of keys are shown in the table 2.

Table 2

Key	Purpose
 	The alphanumeric keys used at editing of configuration name, MAP or B-Scan
 	Change of parameter value in ADJUSTMENT mode, moving in a line of editing
	Point In the editor of names
	Symbol removal in front of the cursor at editing of a configuration name or B-scan
	Space in the editor of names

The right block of the keyboard (Fig. 7) includes a key of ON / OFF of the device, six function keys, navigation keys and switching between operating modes keys.

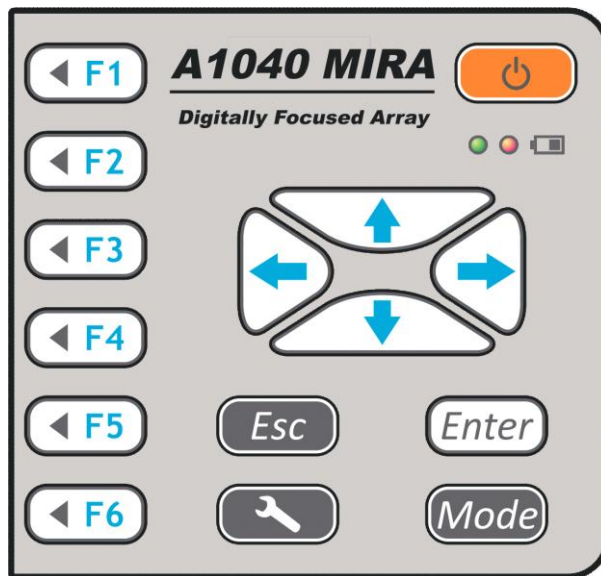


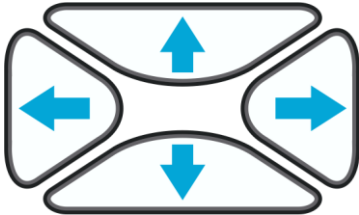






Fig. 6

The basic functions of keys are resulted in the table 3.

Table 3

Key	Purpose
	ON / OFF
	Function keys carry out various actions, depending on the chosen operating mode of the device. The description of current function in the form of the pictogram is shown on the display to the left of each key.
	Navigating keys, used for the cursor navigation, navigation in a MAP, navigation in the editor of names
	Cancellation of operation / an exit from editing without saving
	Enter/exit the ADJUSTMENT mode
	Choice confirmation
	Switching between modes REVIEW / MAP

1.3.4 Systems of a tomograph and condition indications

For your convenience the trigger button is located on the handle. It starts process of sending and receiving of signals.

By pressing the trigger button, the strip if collecting the data appears.

ATTENTION: FOR RECEPTION OF CORRECT RESULTS OF THE CONTROL DO NOT MOVE THE DEVICE AND WEAKEN THE CLAMPING WHILE THERE IS A DATA GATHERING PROCESS!

After the termination of data gathering process the process strip changes its color from red to green – the calculation of data is going.

1.3.5 Operating modes

In the device there is two operating conditions: the REVIEW and the MAP, and a mode ADJUSTMENT.

The REVIEW mode is intended for operative viewing of internal structure of an object in any places. On the screen the B-Scan is displayed.

In addition in the given mode it is possible:

- Automatic velocity measurement.
- Measurement of coordinates and levels of images in the tomogram.
- Measurement of object's thickness.
- Viewing of A-scans.

MAP mode is intended for formation of data file in the kind in a set of object of control B-Scans (perpendicular surfaces) at scanning lengthways before the marked lines with constant step. From saved three measured data file it is possible to display the image of every B-Scan.

The control is spent under the scheme of step-by-step scanning of the control object with data association and volume reconstruction under all scanned area of the control object on the personal computer (PC).

ADJUSTMENT mode is intended for choice and settings of device parameters.

1.3.6 Processing and data presentation on the tomograph screen

In the device the method of synthesized focused aperture with combinational sounding is used (SAFT-C) at which there is an ultrasound focusing in each point of half-space.

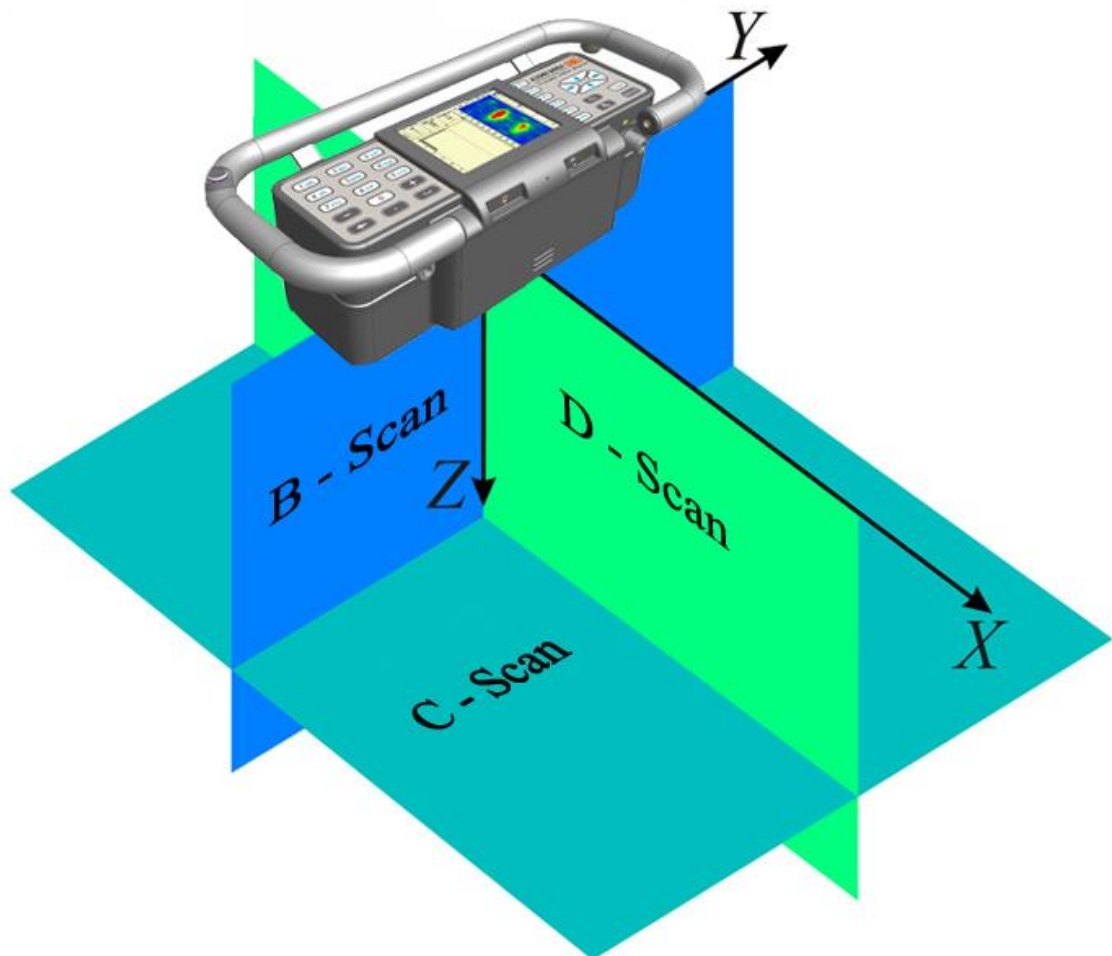
The data file is formed by gathering of the information from all measuring pairs of a dives antenna array. The received signal are processed by an internal computer directly during the work. Later, the processed signals are displayed in the screena and automatically saved into the memory. As a result the evident image as a B-Scan is shown, on which the different color show the reflecting ability of each point in the testing object. Time of data collecting, processing and displaying in the screen is only 5 seconds for each realization.

The device is delivered in the complete set with the specialized software for more detailed processing of the collected data on the external computer.

The software provides data read-out from the device and its representation both in the form of tomograms, and in 3D image that facilitates increase operator's understanding of internal structure of concrete testing object.

For each reflector it is possible to define its lying coordinates in object of the control.

When visualizing the testing object and its cross-sections the three dimensional Cartesian system of coordinates is used in the software. It is adhered to position of the device on the testing object (Fig. 8). At the combined data processing from several realizations of the antenna array (strip), co-ordinates become starts from the first position of the instrument in the line (strip).



Drawing 7

Axis Y is directed lengthways of testing object surface along the long part of tomograph. The right direction is a direction from left to right. The zero is in the middle of the antenna array.

Axis Z is directed in depth of the testing object, it is perpendicular object's surface. The right direction is a direction into the depth of the testing object (where the transducers look). The zero is located on a surface of the testing object.

B-Scan - any section of testing object, perpendicular to axis X.

C-Scan- any section of testing object, perpendicular to axis Z.

D-Scan - any section of testing object, perpendicular to axis Y.

1.4 THE DESCRIPTION OF OPERATING MODES

1.4.1 ADJUSTMENT Mode

Mode ADJUSTMENT is intended for settings and installation of the device parameters.

Work with a tomograph on new testing object is always necessary to begin with this mode.

To enter / exit in mode ADJUSTMENT It is necessary to press a key .

Type of the main screen in a mode ADJUSTMENT is seen on Fig. 9.




Color gain, dB	10	
Analog gain, dB	40	
TGV, dB/m	Off	
Periods number	1.0	
Pause between impulses, us	Off	
Operating frequency, kHz	50	
Using the measured velocity	Off	
Velocity, m/s	2700	
A-Scan type	Empty	






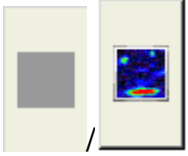

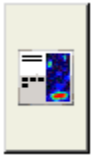
Fig. 8

In the left column the list is of parameters is located and in the right – their values.

Functions of pictograms in a mode ADJUSTMENT while editing the parameters are resulted in the table 4.

Table 4

Key	The pictogram	Purpose
		Adjustment of parametres

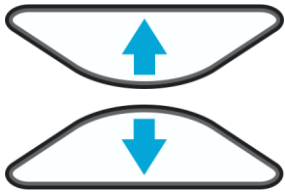


Key	The pictogram	Purpose
		Selection of gain and check of working capacity of the antenna array
		System options of the device
		Absence of the B-Scans saved / Review of B-Scans parameters saved in memory of the device
		Viewing existing and creation of new MAPS

1.4.1.1 Editing of parameters

All parameters of a mode ADJUSTMENT are accessible to editing.

Functions of keys at edition of parameters are shown in the table 5.

Table 5

Key	Purpose
	Moving in the lines for a choice of the edited parameter
	Change of parameter value
	Exit from ADJUSTMENT mode

The name of parameters and their admissible values are resulted in the table 6.

T a b l e 6

The parameter name	Value	Description
Color gain, dB	From 0 to 48 with step1	Change Scale of brightness for the synthesized image
Analog gain, dB	From 0 to 60 with step1	Selection of factor of strengthening in a path of the device for maintenance of the maximum dynamic range in the absence of restriction of signals
TGV, dB/m	Off/ From 0.5 to 10.0 with step 0.5	OFF / Installation of the time corrected gain value (DAC)
Periods number	From 0.5 to 5.0 with step 0.5	Sets up depending on properties of a material
Pause between impulses, us	Off / from 1 to 50 with step 1	Influences reverberation for elimination after sound
Operating frequency, kHz	From 25 to 85 with step 5	Sets up depending on properties of a material
Using the measured velocity	On / Off	Choice of speed for construction of SAFT. On – the measured velocity of shear waves Off – the speed set up in the ADJUSTMENT mode
Velocity, m/s	From 1500 to 4 000 with step 1	Manual velocity setting
A – Scan type	Off / Filled / Empty	Off of display of A-scan field on the screen / Switching between types of display A-scan

1.4.1.2 Selection of gain and checking of an antenna array working capacity

The screen image at selection of analogue gain and checking of working capacity of an antenna array is resulted in Fig. 10. On the screen the signal from the transmitter and the receiver is displayed.

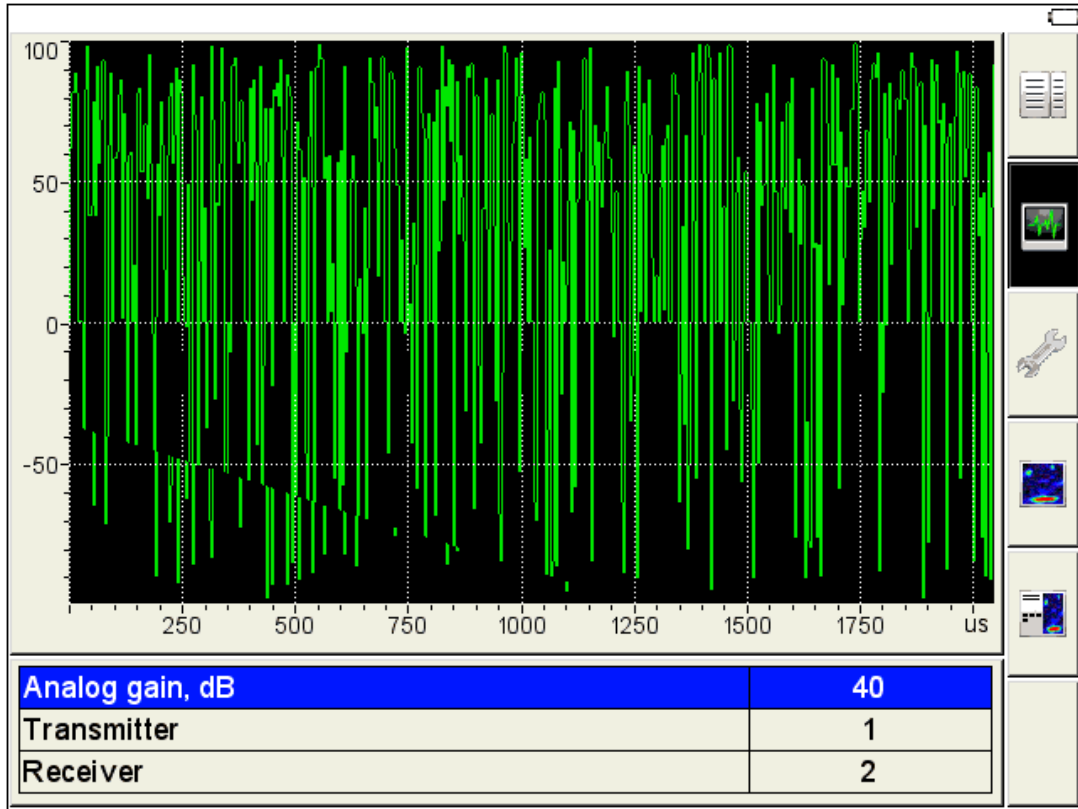
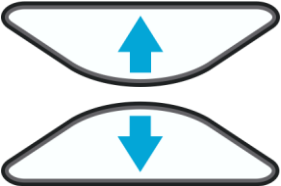




Fig. 9

Functions of keys at selection of analogue gain and checking of working capacity of an antenna array are resulted in the table 7.

Table 7

Key	Purpose
	Moving in the lines for a choice of the edited parameter
	Change of a parameter value
	Exit from a mode ADJUSTMENT

1.4.1.3 System options of the device

The type of the device screen at setting of device system options is seen in Fig. 11.

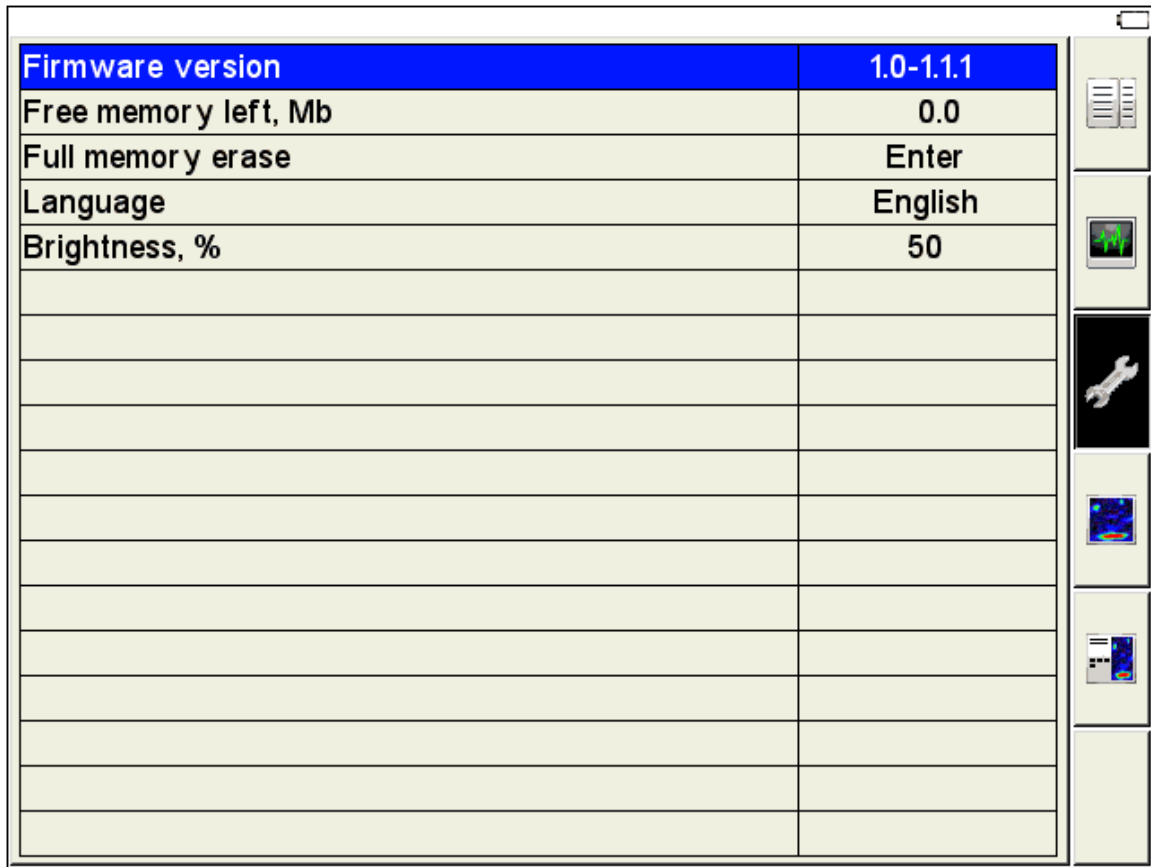


Fig. 10

The name of parameters and their admissible values are resulted in table 8.

Table 8

The parameter name	Value	Description
Firmware version		The current firmware version
Free memory left, Mb		Free memory left
Full memory erase	Enter	Start of memory cleaning procedure of the device by pressing the key Enter ATTENTION: THERE IS A FULL CLEARING OF MEMORY – ALL OPTIONS AND DATA ARE DELETED!
Language	Russian / English	Choice of language of the device interface

The parameter name	Value	Description
Brightness, %	From 1 to 100 with step 1	Installation of illumination brightness on the device screen

1.4.1.4 Viewing of parameters saved in B-Scans

When entering the mode the first line with the name of previously saved B-Scan is highlighted. All the parameters of the previously saved B-Scan are shown on the right side (Fig.12).

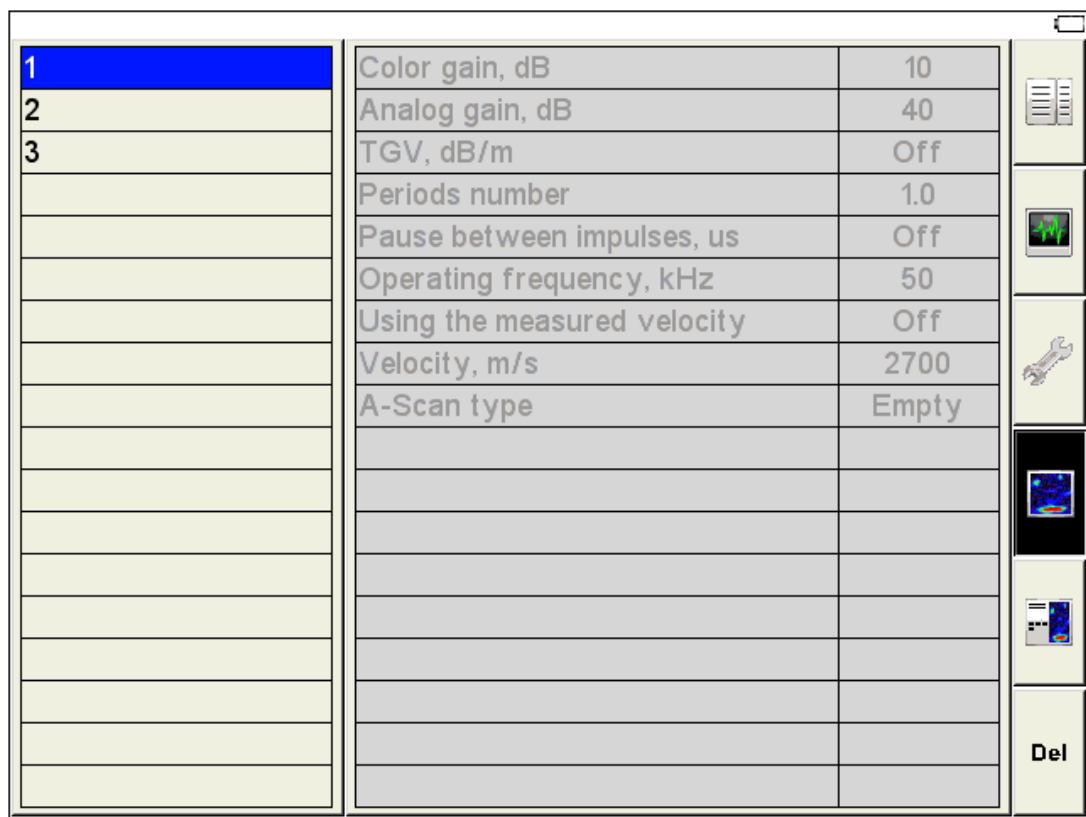






Fig. 11

For viewing of parameters of B-Scan saved, it is necessary to pass on its name by means of keys  .

For viewing of B-Scan saved on the device screen it is necessary to pass on its name in the list and press a key .

For removal of any B-Scan saved it is necessary to press a key .

1.4.1.5 Viewing and creation of maps

When entering the mode, in the list of the map the first line with the default map is highlighted, at this the parameters of the map are shown on the right side (Fig.13). (Drawing 13).












Default map	Color gain, dB	10	     Del
Create map...	Analog gain, dB	40	
	TGV, dB/m	Off	
	Periods number	1.0	
	Pause between impulses, us	Off	
	Operating frequency, kHz	50	
	Using the measured velocity	Off	
	Velocity, m/s	2700	
	Horizontal step, mm	100	
	Vertical step, mm	100	

Fig.13

For Viewing of parameters of map saved it is necessary to pass to its name by means of keys  .

For viewing of the saved B-Scans card on the device screen it is necessary to pass to its name in the list and to press a key .

For removal of every B-scan maps saved it is necessary to press a key . The completely clearance of map list is impossible, therefore at it there will be one map which cannot be removed.

For creation of a new map It is necessary to pass to Line «Create a map ...» by means of keys   (Fig. 14), thus in the right column the parameters established in the point 1.4.1.1 are displayed, i.e. operating at the moment.







Default map	Color gain, dB	10	     Del
Create map...	Analog gain, dB	40	
	TGV, dB/m	Off	
	Periods number	1.0	
	Pause between impulses, us	Off	
	Operating frequency, kHz	50	
	Using the measured velocity	Off	
	Velocity, m/s	2700	
	Horizontal step, mm	100	
	Vertical step, mm	100	

Fig. 12

For change of values it is necessary to press a key . Values of parameters become accessible to editing (Fig. 15).







Default map	Color gain, dB	10	     Del
Create map...	Analog gain, dB	40	
	TGV, dB/m	Off	
	Periods number	1.0	
	Pause between impulses, us	Off	
	Operating frequency, kHz	50	
	Using the measured velocity	Off	
	Velocity, m/s	2700	
	Horizontal step, mm	100	
	Vertical step, mm	100	

Fig. 13

After entering of necessary changes it is necessary to leave editing by pressing a key  (Fig. 16).

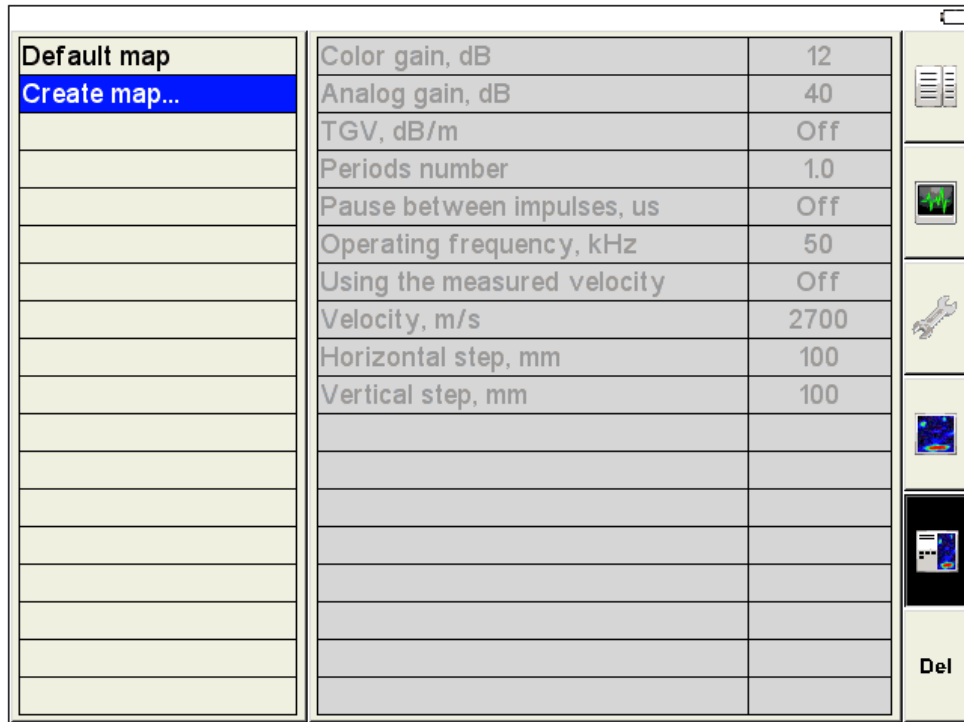


Fig. 14

For saving the map it is necessary to settle its name, for this purpose press a key **Enter**. The edition of a name window will open (Fig. 17).

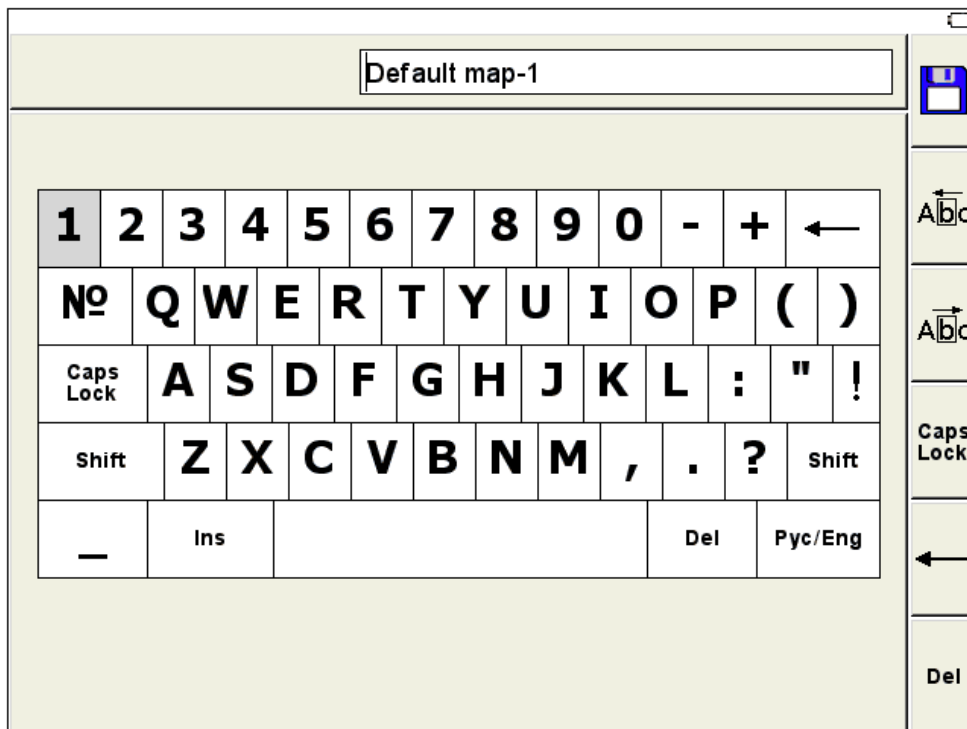


Fig. 15

In default it is offered to save the map under "the default" name with serial number addition. For a map it is possible to appropriate any name (Fig. 18).

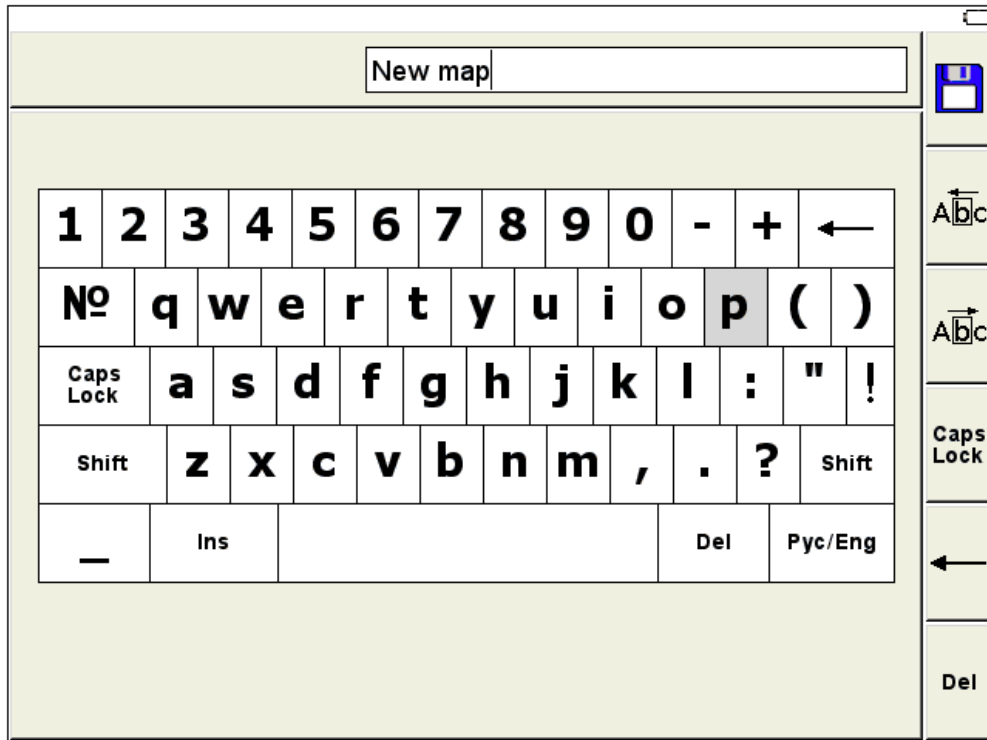



Fig. 16

For saving generated name it is necessary to press a key . Map with a new name will appear in the list (Fig. 19).

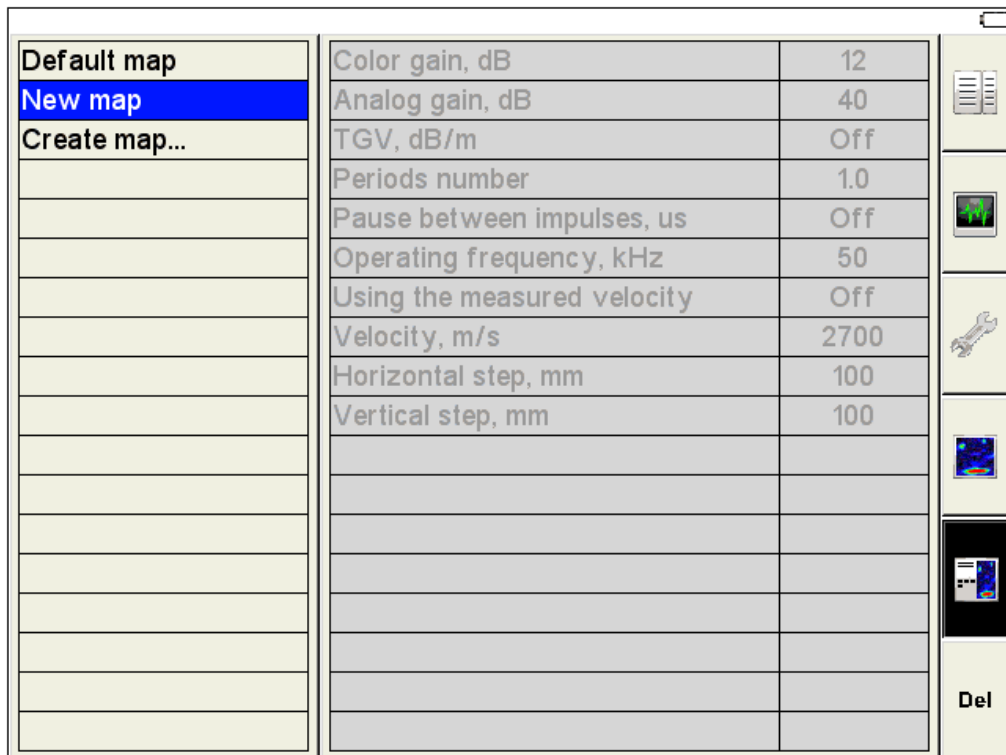
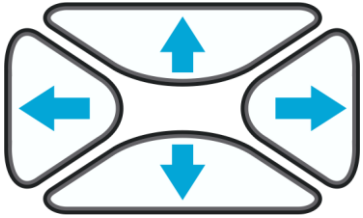








Fig. 17




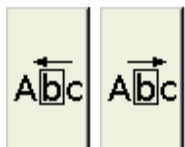


Functions of keys at name editing are shown in the table9.





Table 9

Key	Purpose
	Moving on the keyboard field located on the device screen
	Cursor moving In the field of a name to the left / to the right
	Input in the field of a name a symbol/performance of the action allocated on a keyboard field of the screen
	Input of symbols in the field of a name From the device keyboard
	Symbol removals in front of the cursor in the field of a name
	Insert of a point in the field of a name
	Insert of a space in the field of a name

Functions of pictograms in the ADJUSTMENT mode while name editing are shown in the table10.

Table 10

Key	The pictogramm	Purpose
		Saving of the generated name
		Moving of the cursor in the field of a name to the left / to the right
		Input of capital letters

Key	The pictogramm	Purpose
		Removal of the symbol located to the left of the cursor
		Removal of the symbol located to the right of the cursor

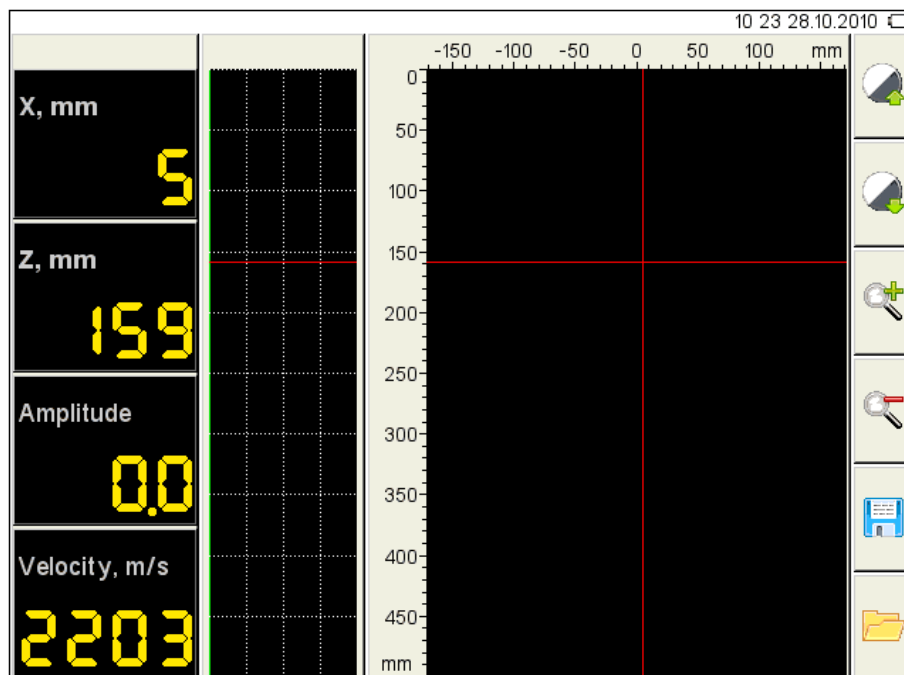
1.4.2 REVIEW mode

The mode is intended for operative viewing of internal OC structure in any places. On appearance of B-cuts images it is possible to estimate correctness of options of the device also.

The mode should be used before consecutive data gathering in the CARD mode.

Work in this mode consists of the following operations: at device installation in a control place of OC the result in the form of the constructed B-scan image is displayed. For check of device options it is necessary to establish the device in those places where internal OC structure is in advance known, and it is possible to check up correctness of the constructed section. These actions are possible to repeat any number of times.

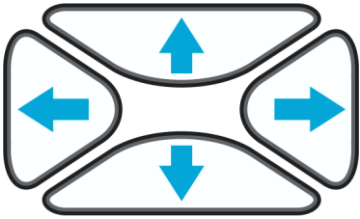


Type of the screen of the device with included A-scan display is resulted on drawing 20.



Drawing 18




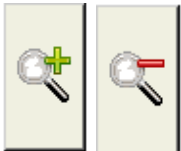




Functions of keys in a REVIEW mode are resulted in table 11.

Table 11

Key	Purpose
	Moving the horizontal and vertical cursor
	Enter the MAP mode
	Enter the УБОГЫЕБУТЕ mode

Functions of pictograms in a REVIEW mode are resulted in table 12.

Table 12

Key	The pictogramm	Purpose
		Increasing / reduction of brightness gain
		Zoom in / Zoom out
		Saving the flowing B-Scan in the device memory
		Absence of the B-Scans saved / Opening and review on the device screen B-Scans

1.4.3 MAP mode

The mode is intended for data gathering about the testing object and their automatic saving, together with current settings of system. The visual control of B-Scans images constructed under the received data is also possible.

Make sure that the B-Scans which are collected in the REVIEW mode are correct, after that you may use the MAP mode.

On the screen only the images of B-Scans received in current position of the device are shown. In memory of the device the received signals and system options are automatically registered.

For switching between the modes, press **Mode**.

After switching on the mode on the screen there is a window of graphic results displaying from the MAP mode similar to window of the REVIEW mode in which images of B-Scans are shown and also the mode of MAP control panel (Fig. 21).

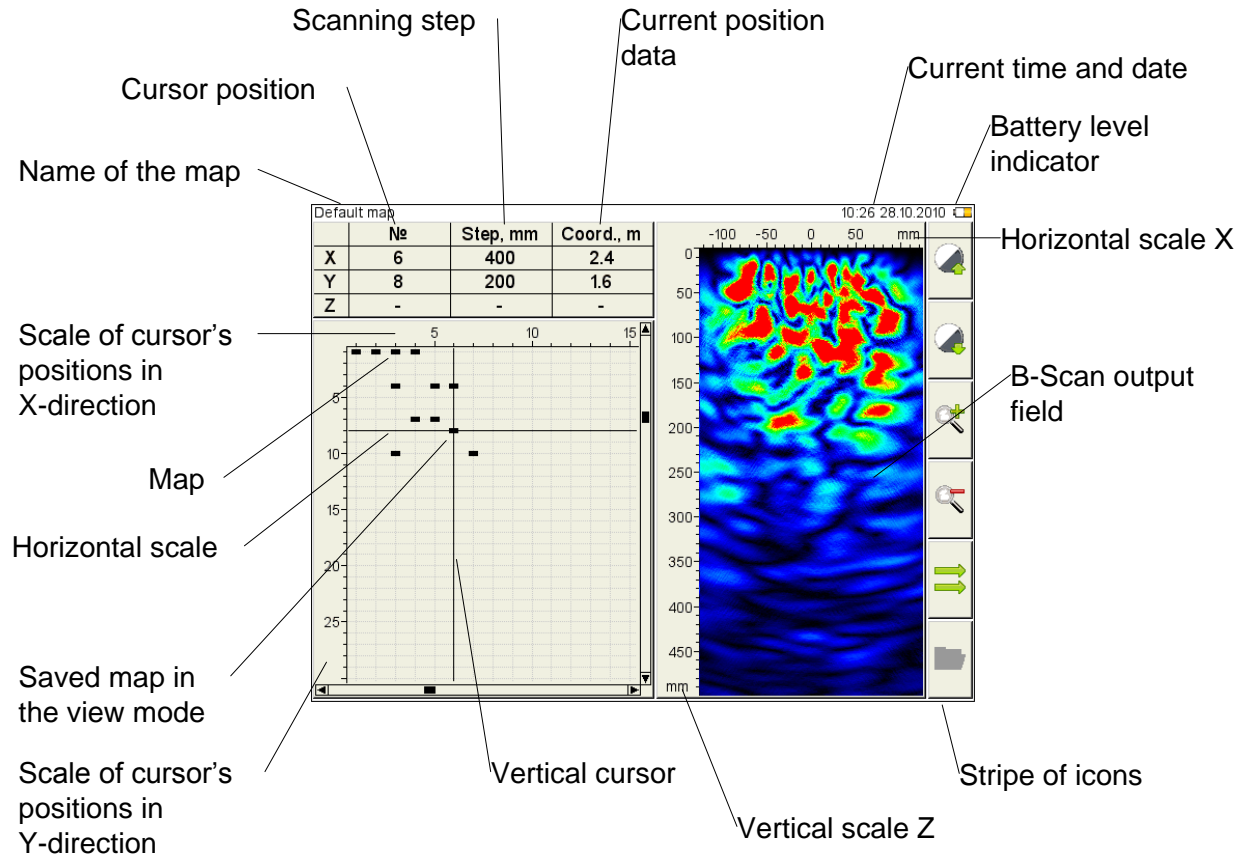
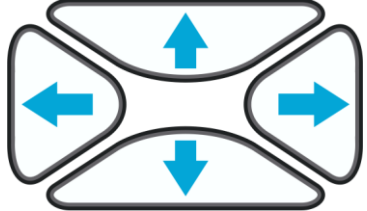




Fig. 19

Functions of keys in a MAP mode are shown in table 13.




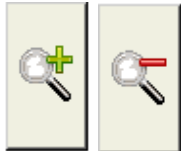




Table 13

Key	Purpose
	Moving of the horizontal and vertical cursor in the field of map



Key	Purpose
	Enter the REVIEW mode
	Enter the ADJUSTMENT mode

Functions of pictogrammes in the MAP mode are shown in table 14.

Table 14

Key	The pictogramme	Purpose
		Increasing / reduction of brightness gain
		Zoom in / Zoom out
		Scanning direction change
		Absence of the saved maps / Opening and viewing on the device screen kept in memory B-Scans maps

1.4.4 Viewing of the saved data

For viewing of the saved data it is necessary in the REVIEW or the MAP mode to press a key , corresponding to the pictogramme .

Type of the viewing screen B-scans saved in the REVIEW mode is shown on Fig. 22.

Name of the saved B-Scan

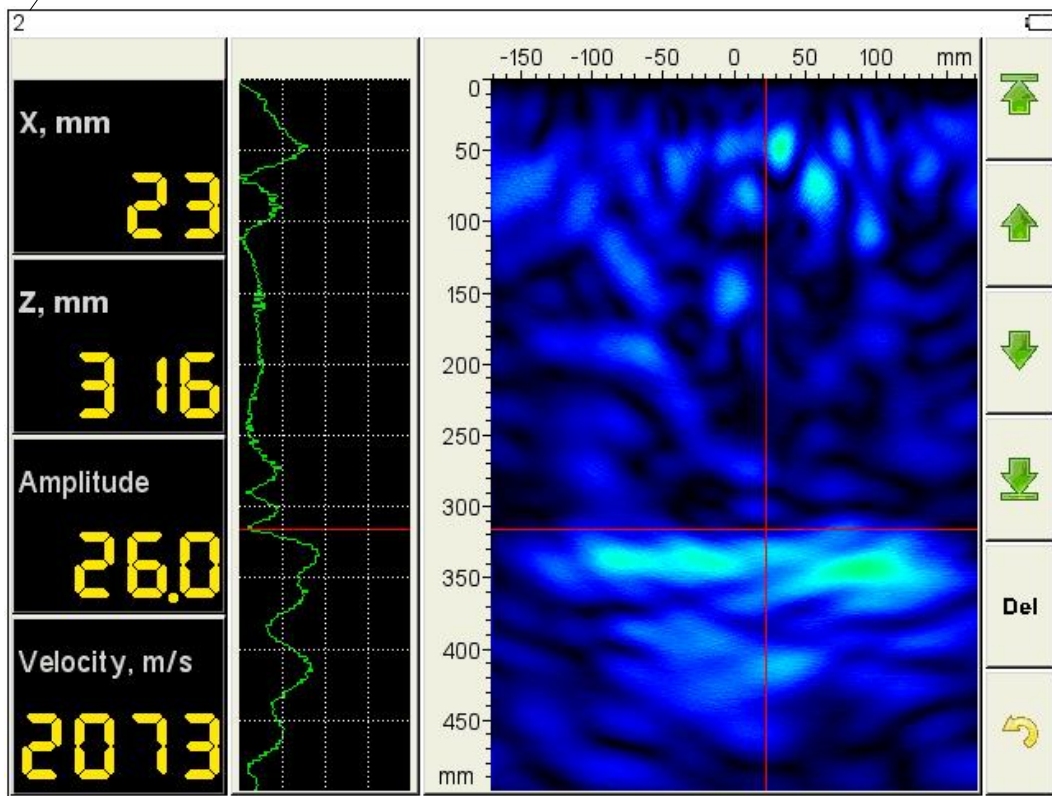


Fig. 20













Functions of keys at viewing of B-scans saved are shown in table 15.

Table 15

Key	Purpose
	Moving of the horizontal and vertical cursor in the field of B-scan
	Exit from viewing of B-scans saved

Functions of pictograms at viewing of saved B-scans are resulted in table 16.

Table 16

Key	The pictogramme	Purpose
		Transition to the first saved B-scan
		Transition to the previous saved B-Scan
		Transition to the following saved B-Scan
		Transition to last saved B-Scan
		Removal of the current B-Scan
		Exit from viewing of the saved B-Scans

2 USING ACCORDING TO PURPOSE

2.1 OPERATIONAL RESTRICTIONS

The device is intended for operation in the conditions of the environment, specified in the item 1.1.2

2.2 PREPARATION OF THE DEVICE FOR USE

2.2.1 Ways of work with a tomograph

There are two ways of inspection of objects with the use of a tomograph – the local and continuous control.

2.2.1.1 The local control

As the local control is called mode of work when the device is placed in any places of testing object surface and it is possible to analyse the internal structure and the cross section in the choosen place. From the received result it is possible at once to receive the necessary information or to choose a direction where it is better to displace the device for reception of fuller information.

2.2.1.2 The continuous control

Continious control is made step-by-step by placing the device continuously with further imaging of the results and saving into the memory. A direction and a displacement step of the device is defined earlier and does not vary in a control current, without dependence from images received on the screen.

The continuous control is applied when full inspection of some area of testing object, with further modeling of the internal structure and saving the data, is necessary. The continuous control is longer procedure which needs the testing object to be marked with a step before starting the testing. In order to check the working capacity of the device, it is highly recommended to test the instrument in the local control mode.

2.2.2 Setting up procedures

The tomograph is delivered ready to work and do not need additional adjustment.

Before the beginning of device work it is necessary to charge the accumulator.

To start work with the device it is necessary to connect the accumulator and to connect the handle and the monoblock by a cable (Fig. 23).



Fig. 21

2.2.2.1 Preparation of testing object surface

By preparation of testing object surface for work it is necessary to clear places of prospective installation of device from a dust and sand, to remove from a surface the materials, disturbing to penetration of low-frequency ultrasonic waves. Any coverings different from concrete on physical properties can interfere the work of the tomograph: polymeric coverings, a waterproofing, thick paint coats.

It is not necessary to use contact lubrication.

Even and smooth surface of the testing object gives a better acoustic contact of device elements with a surface and therefore raises quality of the image. Thus it is necessary to choose whenever possible more even and smooth surfaces. It is possible to work with the roughness of the surface up to 8 mm, however it is better to make the uneven surface smooth.

2.2.2.2 Creation the scheme of scanning and marking of testing object surface

Before testing procedure it is necessary to mark the testing object. The scheme of testing object shows to where and how to place the antenna array. Correctly made scheme accelerates process of gathering of the data and simplifies understanding of results of inspection.

At the local control it is necessary to mark those places where it is supposed to place the device.

At the continuous control more detailed marking is required. All surface of object should be divided into strips with the same width (250 mm is optimal) and the same length. By one approach one strip can be tested, therefore is more convenient choose such direction of strips that them was less, and they were longer. For example, in case of narrow extended objects, it is necessary to have strips along them. Each following strip should adjoin to previous that they covered all testing object surface.


After marking the strips (lines), it is necessary to mark the places where the antenna array will be placed. For this purpose it is necessary to take the marked ribbon with the step of the divisions corresponding to the chosen step of scanning and to attach it on the strip centre.



Any other fastening of ribbon, or other ways of testing object surface marking are admissible .

ATTENTION: THE RIBBON SHOULD BE ATTACHED SO THAT AT THE DEVICE PLACING ANY OF TRANSDUCERS DID NOT GET THE PROTECTOR ON THE RIBBON, IF THAT HAPPENED THE SIGNALS FROM THIS ELEMENT WILL BE DEFORMED!

After testing object marking it is possible to start its inspection.

2.2.2.3 Tomograph switching on

The switching ON of the device is made with the key  on the facial panel of the device.

ATTENTION: DEVICE SWITCHING ON OCCURS TO THE DELAY — AFTER PRESSING KEYS  THE PROMPT WILL APPEAR ON THE DISPLAY IN 10 SECONDS. REPEATED PRESSING KEYS  IN THESE 10 SECONDS WILL LEAD TO DEVICE SWITCHING OFF.

After switching on a green light-emitting diode on the case of the device is on.

2.2.3 Carrying out the control

2.2.3.1 Carrying out the local control

For carrying out of the local control there is the REVIEW mode.

The device is necessary to be placed in proper places of testing surface and to press the trigger button. Further it is necessary to study the received image of section and to draw a conclusion, whether the received data is enough for decision-making or where it is necessary to displace the device for reception of fuller information. The data received at the control in this mode, does not register automatically, therefore they should be written down if necessary manually, as separate shots. To review the saved data it is possible having loaded them in a REVIEW mode.

After reception of all the necessary for decision-making information, work in this mode can be finished.

2.2.3.2 Carrying out of the continuous control

For carrying out of the continuous control there is the MAP mode.

The device is necessary to be placed in position which is noted by testing object marking as the first, and to press the trigger. Further, the device is moved to the next position. In such way the current marked string is inspected and further all marked strips are inspected.

Using the images shown in the screen, preliminary conclusions about testing object can be done. It is necessary to do final conclusions on the personal computer after reception and processing of all the necessary data by specialized software.

3 MAINTENANCE SERVICE

3.1 PERIODIC MAINTENANCE SERVICE

At hit of a dust and a dirt on external surfaces of device it is necessary to wipe them with dry either damp rag or a napkin. At hit of a dirt and extraneous particles in connecting sockets it is necessary to clear their soft brush.

At pollution of ceramic protectors the device acoustic contact with testing object is possible. Therefore it is necessary to examine them periodically and, if necessary, to clear ceramic protectors of elements with fabric moistened with spirit.

3.2 WORKING CAPACITY RESTORATION



3.2.1 Working capacity restoration

At failed of correct device work, long pauses, absence of the image and signals, occurrence on the screen of an error message and other supernumerary events it is necessary to switch off and then switch on the device.

3.2.2 Possible troubles

In table 17 the problems with the device that can be solved by the operator, are shown.

Table 17

Trouble signs	The possible reasons	Troubleshooting
The device does not switch on	Error in memory of the device	To include the device with dump of options: 1. To press and keep a key  2. To press a key 

If the taken measures have not restored working capacity of the device contact the manufacturer.

4 STORAGE

The device packed into a transport suitcase should be stored in a dry premise according to storage conditions as agree in GOST15150-69.

Indoors for storage there should not be a current-carrying dust, steams of acids, alkalis, and also the gases causing corrosion and destroying isolation.

5 TRANSPORTATION

The device in a transport suitcase with the complete set of accessories can be transported by the railway, motor transport and in heated plane compartments in the conditions established by GOST12997-84 and operating rules of transportation of cargoes.

At transportation protection against an atmospheric precipitation and blows should be established. Arrangement and cargo fastening in vehicles should provide steady position of cargo at transportation.

LOW-FRQUENCY ULTRASONIC TOMOGRAPH A1040 MIRA

OPERATION MANUAL

2010