GEODEVICE

MANUAL

PIMV — portable magnetic susceptibility meter

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Description and operation of the equipment

Purpose of the equipment

PIMV is a portable magnetic susceptibility meter (hereinafter referred to as the device) designed for geophysical research in order to determine the magnetic properties of rocks by measuring the magnetic susceptibility of samples, boreholes cores in laboratory and field conditions.

The device is used in geological mapping and petromagnetic studies and solves the problem of rocks and ores differentiation in accordance with their magnetic susceptibility in the range from $1 \cdot 10^{-7}$ to 1 SI.

Main technical data and specifications

Table 1 Technical specifications, parameters, and dimensions

Parameter	Value
Apparent magnetic susceptibility measurement range	-1 ÷ 1 SI.
Sensitivity	1×10^{-7} SI.
Internal non-volatile memory	up to 32 GB (SD card)
Power supply	3 AAA batteries
Navigation	built-in GLONASS/GPS module
Interface for transfer of data to an external device	USB 2.0, Bluetooth 2.1 EDR
Recording and playback of audio tags	Yes
High contrast LCD display with backlight	Yes
Operating temperatures	- 20 ÷ +60°C
Protection	IP65
Overall dimensions	144×74×32 mm
Weight of the device without its case with batteries	225 g

Delivery set

Figure 1 PIMV — portable magnetic susceptibility meter

Components of the device and changes in the delivery set

Table 2 Delivery set

Name	Quantity
Magnetic susceptibility meter PIMV	1 pc.
Memory card microSDHC 4 GB	1 pc.
Case	1 pc.
Charging dock	1 pc.
Operating manual	1 pc.

Device setup and operation

The operation of the device is based on the frequency method for measuring magnetic susceptibility. A flat induction coil, which is located on the working surface of the device case and is a frequency-setting element of a low-frequency generator, is used as a primary transducer. The generator frequency is about 10 kHz.

The device measures the oscillation frequencies of the generator when the primary transducer is placed "in the air" (away from the sample or rock under study) and in the presence of a magnetic medium, when the transducer coil is closely put on the surface of the test sample and calculates the magnetic susceptibility according to the following formula:

$$\kappa' = k \cdot (\frac{F_0^{\ 2}}{F^{\ 2}} - 1) \qquad (1)$$

in which F_0 – oscillation frequency "in the air",

F - frequency in the presence of a magnetic medium,

k – device calibration factor.

The device measures the "apparent" magnetic susceptibility. In general, it differs from the true susceptibility depending on the dimensions and geometric shape of the tested surface.

When the measurement takes place on a flat surface of a half-space, the transition from the values of the "apparent" magnetic susceptibility κ' to the true one's (κ) is realized according to the formula:

$$\kappa = \frac{\kappa'}{1 - 0{,}5\kappa'} \qquad (2)$$

With values of the "apparent" magnetic susceptibility $\kappa' \leq 0{,}1$ SI units, we can assume that что $\kappa' = \kappa$.

The device is calibrated for idealized conditions according to which the measuring coil is in contact with an absolutely smooth plane limiting the half-space represented by a homogeneous isotropic magnetic medium with a magnetic susceptibility κ.

When the working surface of the device is not in tight contact with the tested surface, the measured value is below the "apparent" magnetic susceptibility of the medium under study. Table 3 shows the dependence of the relative value of magnetic susceptibility on the size of the gap between the device and the medium.

The unevenness of the surface is the "protrusion-recess" difference, i.e. the distance between the highest point of the largest protrusion and the lowest point of the maximum recess on the surface of the area, along which the working surface of the device contacts the surface under study during measurements. Unevenness is evaluated by observing the gap between the measured surface and the working surface of the device.

Table 3

Gap size, mm	Relative value of magnetic susceptibility, %
0	100
5	42
10	19
15	10

Table 4 shows corrections for unevenness up to 10 mm. The corrected value can be obtained by multiplying the measured value by an appropriate correction factor.

Table 4

Unevenness, mm	Correction factor
1	1,07
2	1,15
3	1,23
4	1,32
5	1,41
6	1,51
7	1,61
8	1,72
9	1,84
10	1,96

When performing measurements on the surface of samples with an inscribed circle diameter of less than 100 mm, it is necessary to introduce corrections for the final dimensions of the area (see Table 5). The measured values must be multiplied by an appropriate correction factor.

Table 5

Sample size, mm	Correction factor
60	1,19
70	1,11
80	1,05
90	1,03
100	1,01

When measuring cores, it is best to put the sensor to the side surface of the core, and not to the end, because the side surface is a smooth cylindrical surface, while the end is usually small in diameter and uneven.

The values obtained from measurements on a cylindrical surface are systematically lower than the ones measured on a plane and therefore need to be corrected.

Correction factors are given in Table 6, and the measured values must be multiplied by the factor.

Table 6

Core diameter, mm	Correction factor
32	1,77
42	1,55
58	1,37
75	1,30
94	1,20
105	1,18

It is necessary that the length of the measured core be greater than 100 mm.

When performing measurements on outcrops, it is necessary to consider the degree of weathering, which significantly affects the results of the studies. The effect of weathering is difficult to account for, so it is preferable to perform measurements on an unweathered, although more uneven surface.

For each measurement, it is necessary to evaluate the unevenness of the surface and apply the appropriate corrections from Table 3. It is not recommended to make measurements on surfaces whose unevenness is greater than 5 mm.

It is not recommended to measure samples which are less than 50 mm thick and whose horizontal dimensions are smaller than the diameter of the working surface of the device (60 mm). If the diameter of the circle approximating the measurement surface is less than 100 mm, the obtained data should be corrected in accordance with Table 5. First of all, the measured values should be corrected for unevenness according to Table 4, and then Table 5 should be used.

Intended use of the device

Preparing the device for use

The device controls are shown in Figure 2.

Figure 2

Control key functions:

Key

:

- Turning the device on/off,
- Recording an audio tag,
- Entering the audio tag window for playback.

Key

:

- Calibration/measurement,
- Confirmation of the operation,
- Entering the window for viewing the results of measurements performed in continuous mode.

Key :

- Returning to the previous level,
- Canceling the operation.

Key :

- Entering the settings screen from the main screen,
- Selecting the parameter value in the settings screen,
- Deleting data in view screens.

Installing batteries:

To install the batteries, remove the battery compartment cover (Figure 3), install the batteries observing the polarity and put the cover back into its place.

Figure 3

Connecting a computer via USB and accessing the SD card:

Remove the battery compartment cover, the mini USB connector is on its top right.

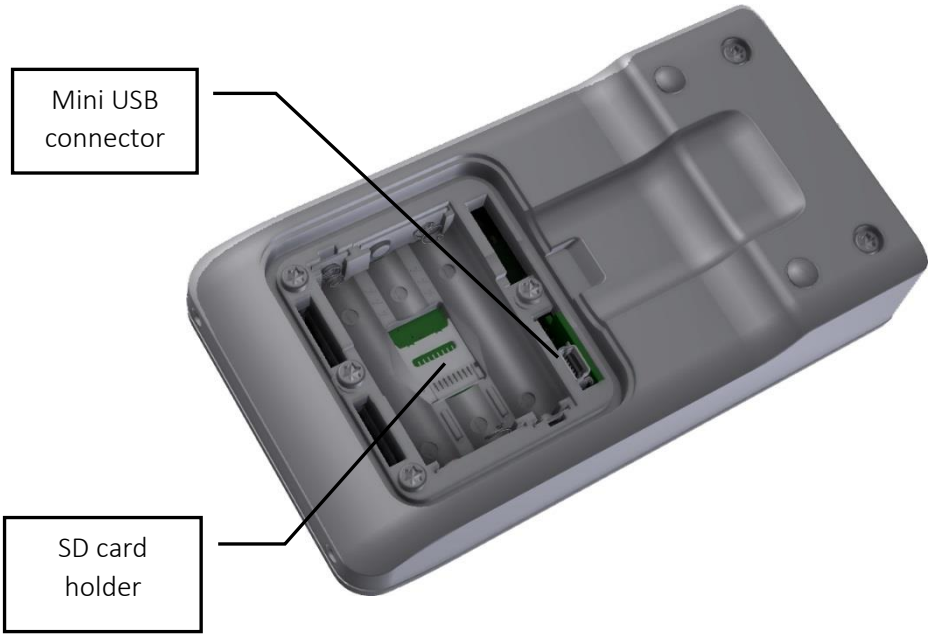


Figure 4

Under the batteries is the SD card holder. To access the card, slide the holder cover in the direction indicated by the arrow, after which the cover can be lifted and the memory card removed.

Using the device

Turn on the device by pressing the key

.

The indicator displays the main screen (Figure 5).

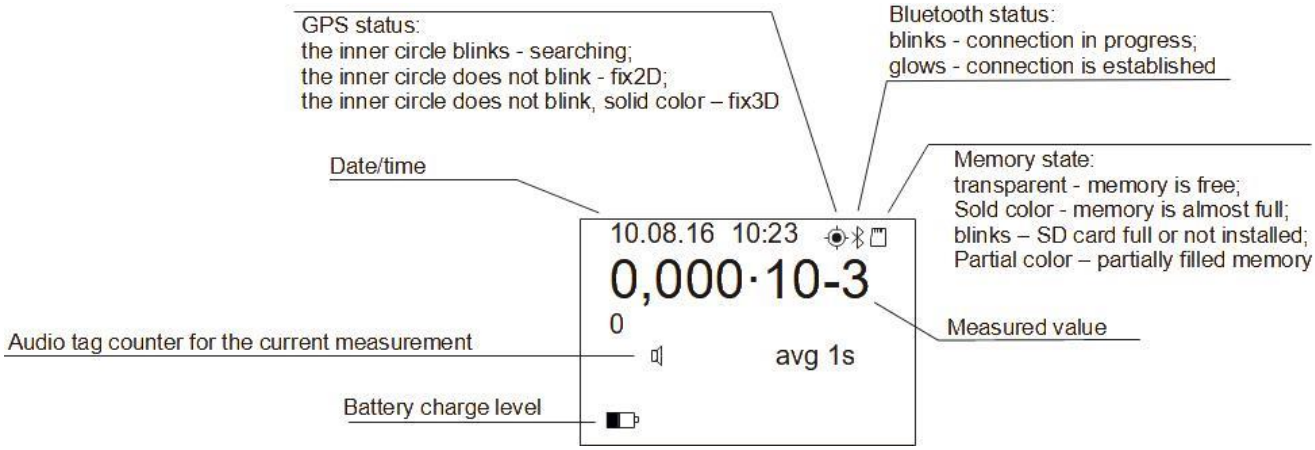


Figure 5

In any of the 3 modes of the device, the measurement begins with calibration in air by pressing the key

.

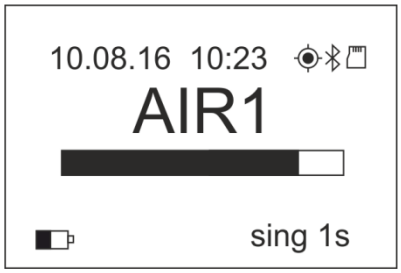


Figure 6

After the first calibration is completed, the device goes into the sample measurement standby mode.

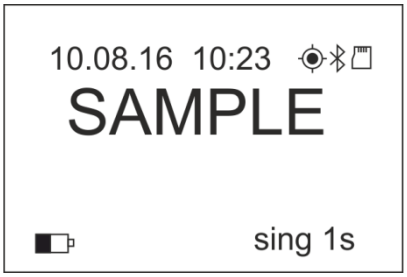


Figure 7

Within 10 s after calibration, put the measured sample close to the working surface of the primary transducer and press the key

again. At the end of the measurement on the sample, the device goes into standby mode for the second calibration in air to compensate for temperature drift.

Figure 8

When the measurement is completed, the indicator displays its result.

If within 10 s after calibration the measurement was not made, the device returns to its original state. To record an audio tag associated with a measurement press and hold the key

. After 2 seconds, without releasing the key, record the voice information. Release the key when you are done. The audio tag will be saved to a file on the SD card.

The measurement of the average value when the corresponding mode is selected in the settings menu is carried out in a similar way, but in three stages: Air-Sample-Air-Sample-Air-Sample-Air.

To switch to the continuous measurement (scanning) mode, select the appropriate operating mode in the settings menu, calibrate the device, and after it switches to the sample measurement standby mode

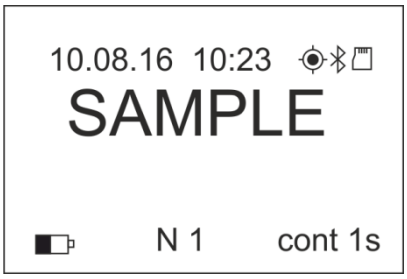


Figure 9

press key

. The device will switch to the continuous measurement mode, and the indicator will display the current measured value and the measurement number

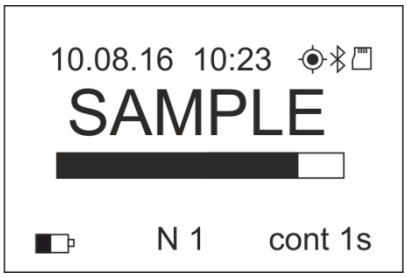


Figure 10

The device will remain in the continuous measurement mode until the OK key is pressed again, after which it is necessary to re-calibrate in air. The corrected measurement values will be stored in the device's memory. Pressing the < key will stop the measurement without saving the result.

To turn off the device, briefly press key Rec in the main screen. After that, a confirmation window will be displayed:

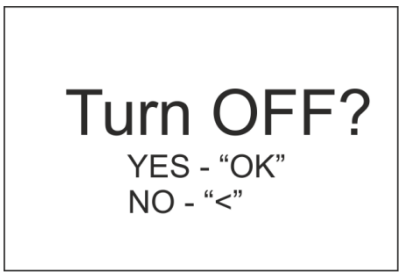


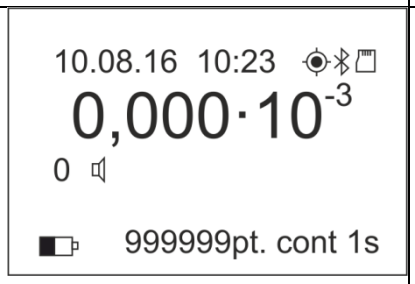
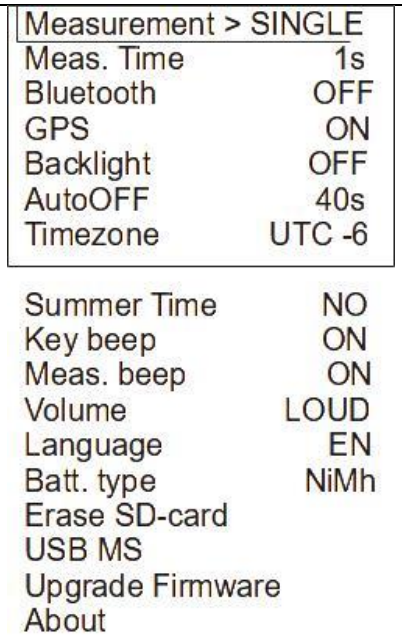
Figure 11

Press the OK key to turn off the device, press < to cancel.

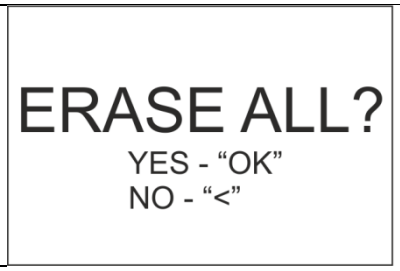
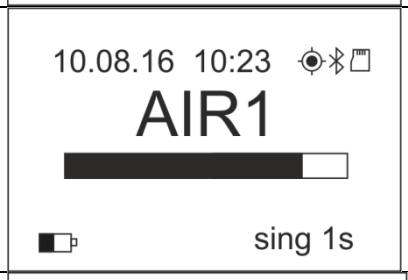
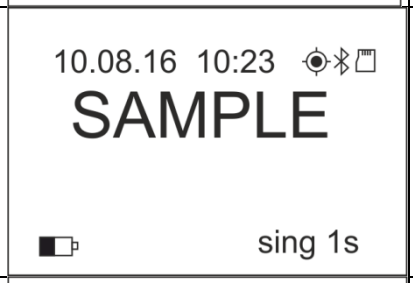
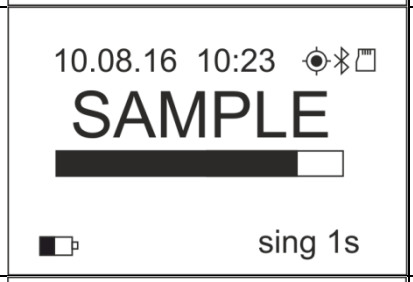
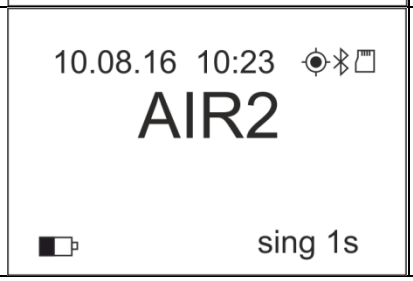
If no key is pressed within the timeout period set in the settings menu, the device turns off automatically.

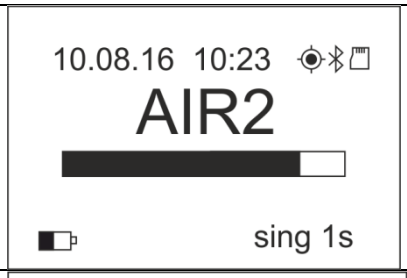
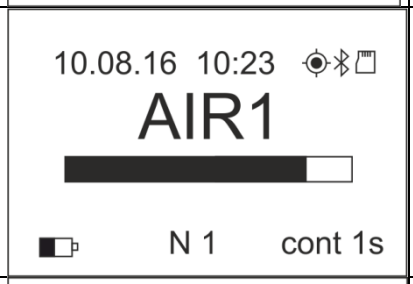
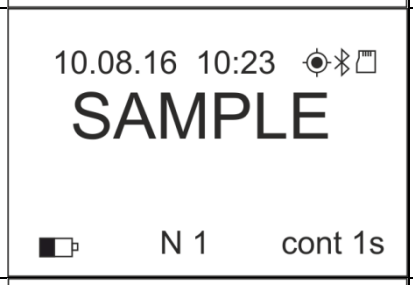
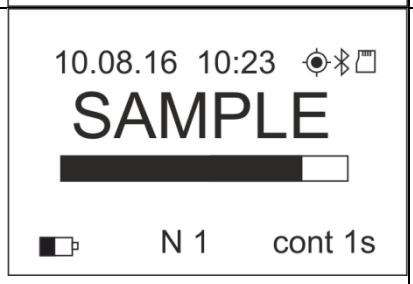
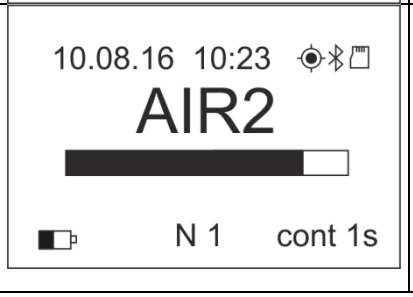
Device operating screens and menu system. Appendix 1 shows a block diagram of the transitions between the device screens. Table 7 summarizes all operating screens of the device with comments.

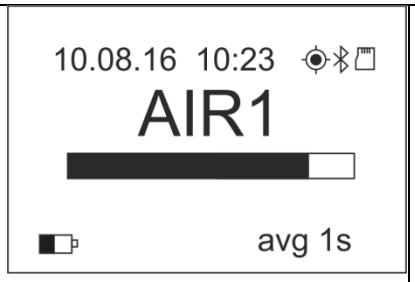
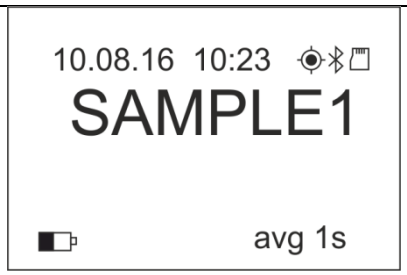
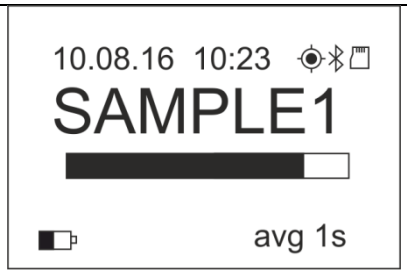
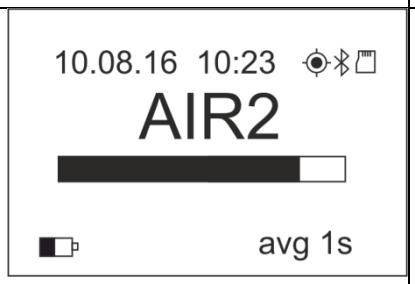
Table 7

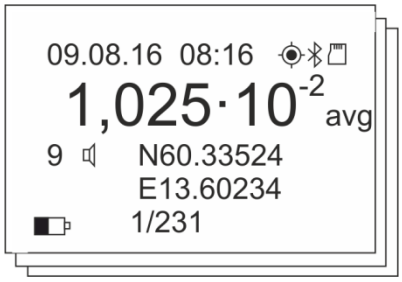
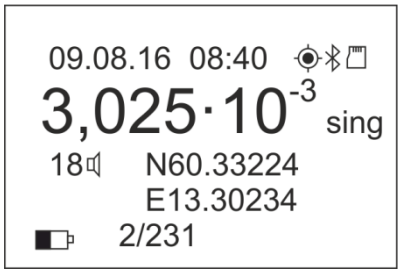
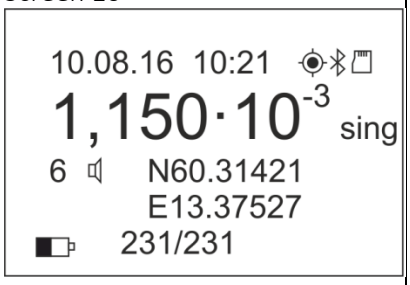
Screen №	Screen	Comment
1		**Main screen** The location of each element on the screen is shown in the general diagram. It shows the date, time of synchronization with GPS, visualizes the status of GPS, BT, memory card, it shows the last measured value (when turned on it shows $0.000 \cdot 10^{-3}$), audio tag counter and charge level, total number of saved points in memory, selected measurement mode and measurement (accumulation) time in seconds. The status of the status bar items is updated as events occur (the clock is running, the GPS status is displayed depending on the "capture" of satellites, etc.) A short press of the "Rec" key means you will be taken to screen 18 "Turning off the device"
15		**Settings screen** **Called up by pressing the RIGHT key.** The main settings of the device are selected on the screen. The UP/DOWN keys allow you to cycle through the menu. The active menu bar is indicated by a "poker" and a "greater than" sign (└── > see the block diagram) The LEFT key brings you back to screen 1 The RIGHT key allows you to cycle through the parameters of the selected item. In **Measurement**, the measurement mode is selected: - SINGLE – single measurement - AVG3 – average of 3 points - CONTIN. – continuous measurement mode In **Meas. Time**, the measurement tome is indicated: - 0.5s – 0.5 seconds - 1s – 1 second - 3s – 3 seconds - 5s – 5 seconds - 10s – 10 seconds In **Bluetooth**, the BT is turned on and off: - ON – BT is turned on - OFF – BT is turned off If BT is turned (ON) but has not been used for connection to an external device for the last 10 minutes, it will automatically turn off to save the device's battery. When the module is turned off, the BT icon is not displayed. In **GPS**, the GPS module is turned on and off (switching the module to power-saving mode without capturing satellites, but with a working RTC).

		In **Backlight**, the screen backlight mode of operation is indicated: - OFF – the backlight is off - 5s – the work time after the last pressing of any key is 5 seconds - 10s – 10 seconds - 20s – 20 seconds - 30s – 30 seconds In **AutoOFF**, the time for the auto-off timer is specified. - 30s – 30 seconds - 40s – 40 seconds - 1min – 1 minute - 2min – 2 minutes - 5min – 5 minutes - 10min – 10 minutes In **Timezone**, the time zone in increments of 1 or 0.5 hours is indicated: UTC +11:30 – UTC time + 11 hours 30 minutes In **Summer time**, the summer/winter time is set: - YES – the clocks go forward 1 hour in the summer (summer and winter are determined in accordance with Appendix 1) - NO – no clock changes In **Key Beep**, the sound indication of pressing any key is turned on: - ON – the sound is turned on - OFF – the sound is turned off In **Meas. Beep**, the sound indication of the measurement is turned on: - ON – the sound is turned on - OFF – the sound is turned off In **Language**, the menu language is selected: - ENG – English - РУС – Russian In **Batt type**, the type of power source used is selected for correct accounting and indication of the remaining amount of charge. - ALCALINE – alkaline batteries - Ni-MH – accumulators There is no option in **Erase memory**. Selecting this menu bar and pressing the RIGHT key will take you to screen 16. The default parameter values are shown in the screenshot. Changes are stored in the non-volatile memory, except for the Bluetooth parameter which is reset to “OFF” when the idle trigger is fired.

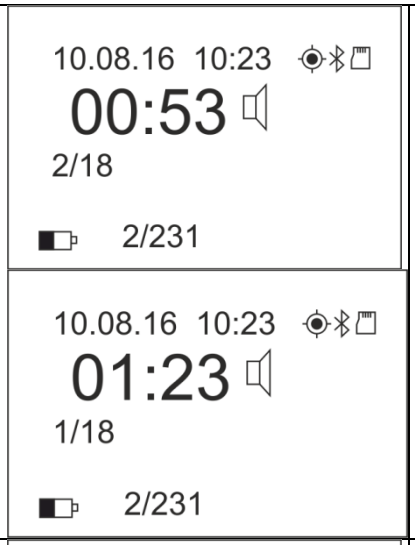
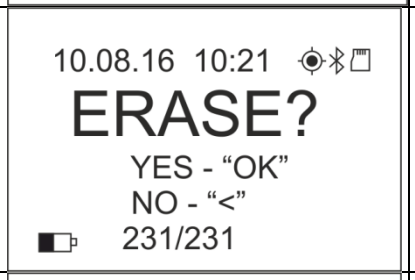
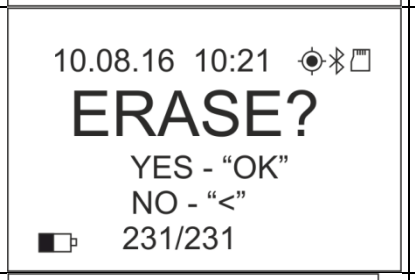
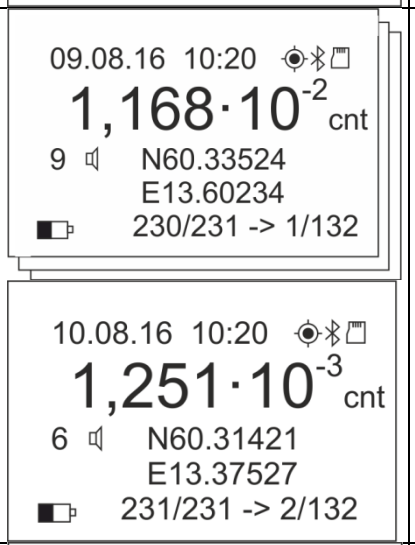
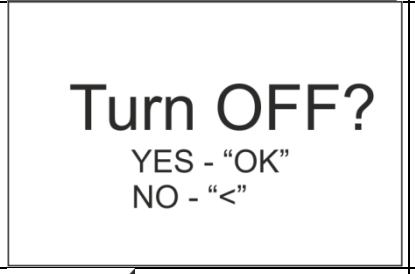
		USB MS - the device enters the external storage mode MASS STORAGE. When connected via USB to a computer, it is displayed as an external drive. **Firmaware –** the current firmware version is displayed.
16		**Delete mode** Pressing OK takes you to screen 17 and erases the data. Pressing the LEFT key takes you to screen 15 without erasing the memory.
17		**Data deletion progress bar** During the deletion of data, a filled rectangle runs cyclically in the progress bar with an interval of about 2-3 seconds (you need to choose the optimal time for perception).
1.1		**Single measurement mode (measurement "in the air" 1)** A measurement is performed "in the air", the progress bar is filled in the time selected in the **Meas. Time** menu bar, it is followed by a BEEP (if **Meas. Beep** is **ON**) and you are taken to 1.2.
1.2		**Single measurement mode (waiting for OK to be pressed)** The device is waiting for an OK command to start performing measurement on the sample.
1.3		**Single measurement mode (performing measurement on the sample)** A measurement is performed on the sample, the progress bar is filled in the time selected in the **Meas. Time** menu bar, it is followed by a BEEP (if **Meas. Beep** is **ON**) and you are taken to 1.4.
1.4		**Single measurement mode (waiting for measurement "in the air" 2)** The device is waiting for the OK key to be pressed to perform measurement "in the air".

1.5		**Single measurement mode (measurement “in the air” 2)** A measurement is performed “in the air”, the progress bar is filled in the time selected in the **Meas. Time** menu bar, it is followed by a BEEP (if **Meas. Beep** is **ON**) and you are taken to 1, where the measurement result is displayed.
2.1		**Continuous measurement mode (measurement “in the air” 1)** A measurement is performed “in the air”, the progress bar is filled in the time selected in the **Meas. Time** menu bar, it is followed by a BEEP (if **Meas. Beep** is **ON**) and you are taken to 2.2.
2.2		**Continuous measurement mode (waiting for OK to be pressed)** The device is waiting for the OK key to be pressed to perform measurement on the sample.
2.3		**Continuous measurement mode (performing measurement on the sample)** The measurement is cyclically performed on the sample in automatic mode, the progress bar displays the status of the current measurement, the number of the current measurement is shown. Measurements are performed until the OK key is pressed, which interrupts the current measurement without saving its result, then you are taken to screen 2.4. During the measurement, after the first cycle is completed, the last measured value is displayed instead of "SAMPLE".
2.4		**Continuous measurement mode (waiting for measurement “in the air” 2)** The device is waiting for the OK key to be pressed to perform measurement “in the air”.
2.5		**Continuous measurement mode (measurement “in the air” 2)** A measurement is performed “in the air”, the progress bar is filled in the time selected in the **Meas. Time** menu bar, it is followed by a BEEP (if **Meas. Beep** is **ON**) and you are taken to 1, which shows the last result of the last measurement and the total number of measurements taken in the series.

3.1		**Average of 3 points mode - measurement “in the air” 1** A measurement is performed “in the air”, the progress bar is filled in the time selected in the **Meas. Time** menu bar, it is followed by a BEEP (if **Meas. Beep** is **ON**) and you are taken to 3.2. AIR1 is displayed for the first measurement “in the air” in the series AIR2 is displayed for the second measurement “in the air” in the series AIR3 is displayed for the third measurement “in the air” in the series AIR4 is displayed for the fourth measurement “in the air” in the series
3.2		**Average of 3 points mode - Waiting for OK to be pressed** The device is waiting for the OK key to be pressed to perform measurement on the sample. SAMPLE1 is displayed for the first measurement on a sample in the series. Instead of SAMPLE1, the value of the previous measurement is displayed on the second and third cycles.
3.3		**Single measurement mode (performing measurement on the sample)** A measurement is performed on the sample, the progress bar is filled in the time selected in the **Meas. Time** menu bar, it is followed by a BEEP (if **Meas. Beep** is **ON**) and you are taken to 3.4. Instead of SAMPLE1, the value of the previous measurement is displayed on the second and third cycles.
3.4		**Average of 3 points mode - waiting for measurement “in the air” 2** The device is waiting for the OK key to be pressed to perform measurement “in the air”. After the OK key is pressed, you are taken to the screen similar to 3.1. The cycle ends when 4 measurements “in the air” and 3 measurements on the sample have been taken in the following order: Measurement “in the air” 1 -> measurements on the sample 1 -> measurement “in the air” 2 -> measurements on the sample 2 -> measurement “in the air” 3 -> measurements on the sample -> measurement “in the air” 4 -> then you are taken to the **main screen** AIR2 is displayed for the second measurement “in the air” in the series AIR3 is displayed for the third measurement “in the air” in the series AIR4 is displayed for the fourth measurement “in the air” in the series. After the end of the measurement cycle, the arithmetic mean is displayed on screen 1.

4		**Recording an audio tag** Recording continues while the Rec key is pressed. Ehe stopwatch of the audio tag, the microphone icon, the serial number of the current audio tag, and the rest of the information indicated in the screenshot are displayed on the screen during recording. Audio tags shorter than 2 seconds are not stored (considered to be erroneous). When the Rec key is released, a short beep is heard (if **Key Beep** is **ON**), and you are taken to the main screen, where the audio tag counter increases by 1. You can create up to 99 audio tags per point. If this number of audio tags is reached, the device should beep three times instead of entering the recording mode and remain in the current screen.
5-6, 10,12	Screen 5  Screen 6  Screen 10  Screen 12 	**Viewing measurements in chronological order** You leave the **main screen** when the following keys are pressed: • UP – viewing the very first value for the <u>current working day</u> • DOWN – viewing the last measured value (i.e. the value remains the same as on the main screen, but the coordinates and measurement mode appear). The measurement result, its measurement mode, the number of audio tags for this measurement, coordinates (if the satellites were acquired during the measurement) or dashes (if the satellites were not acquired), the serial number of the measurement, indicating through a "/" the total number of measurements, and the status of the battery are displayed on the screen. The date and time of the visualized measurement and the current GPS, BT and memory card statuses are displayed on the top line. <u>Moving from measurement to measurement:</u> Pressing the DOWN key again and all subsequent presses of this key show the value with the measurement number 1 less than the current one, and pressing the UP key shows the measurement result with the number 1 greater than the current one. If you press the UP key while visualizing the last measured value, the very first measurement in chronological order is displayed on the screen. <u>Autoscrolling:</u> When the DOWN or UP key is pressed for a long time (1.5 s), the automatic scrolling starts in the corresponding direction, and the scrolling speed changes as follows: the first 5 values are scrolled once every 1 second, the next 10 values are scrolled with a delay of 0.5 seconds, all the following ones are scrolled with a delay of 0.25 seconds. Autoscrolling continues until the UP or DOWN key is released. <u>Scrolling by working days:</u>

		When the RIGHT or LEFT key is pressed for a long time, the sequential uniform (without acceleration) scrolling through working days starts with the visualization: - scrolling to the RIGHT displays the last value for the visualized (scrolled) day. - scrolling to the LEFT displays the first value for the visualized (scrolled) day. If the screen displays not the first or not the last measurement for any day, then a long press of the RIGHT or LEFT key leads first to displaying the last or first measurement for the visualized day, and then the last or first value of the next or previous working day. The transition is cyclical, i.e. if the last or very first measured value is displayed on the screen, then a long press of the RIGHT or LEFT key takes you to the last measurement on the first working day or the first measurement on the last working day. If any value measured on the visualized working day (except for the last one) is displayed on the screen, then a long press of the RIGHT key takes you to the last measured value of the day, and only then the scrolling of days begins. The situation is similar with a long press of the LEFT key. Switching to the screen for erasing the current record: Pressing the RIGHT key quickly takes you to screen 11, where you can erase the current value. Switching to the screen for listening to audio tags: A short press of the REC key takes you to screen 7, where you can listen to audio recordings. Switching to the screen for recording an audio tag for measurement: Pressing and holding the REC key takes you to screen 4, where you can record an audio tag for the currently selected value. If scrolling through a measurement takes you to a series of measurements, the information shown on screen 12 is displayed. In this case, if you press the OK key, you are taken to screen 13.

7-8		**Audio tags listening mode** Listening starts after pressing OK and stops after pressing OK, which in this case actually works as play/pause. Press the UP and DOWN keys once to scroll through the audio tags. Holding the UP and DOWN keys scrolls through the tags, similar to scrolling through the measurements on screen 5. Press and hold the REC key to go to screen 4, where you can record an additional audio tag for the value you are viewing. Press the RIGHT key to go to screen 9 where you can delete the current audio tag.
9		**Delete current audio tag mode** Pressing the OK key deletes the current audio tag and takes you back to screen 8. Press the LEFT key to go back to screen 8 without deleting anything.
11		**Delete point mode** To access this screen, press the RIGHT key in the view menu. Pressing the OK key deletes the current point and takes you back to screen 10. Pressing the LEFT key takes you back to screen 10, nothing is deleted.
13-14		**Viewing a point in the CONTINUOUS mode** Scrolling through measurements in a series works similarly to scrolling through points on screen 5 (of course, without scrolling through the days). Pressing the RIGHT key takes you to the menu for deleting the current visualized measurement from the series (i.e., not the entire series, but only the current one!).
18		**Turning off the device** Pressing the OK key will turn off the device. Pressing the LEFT key will take you to screen 1.
		A counter showing the number of audio tags for the point.

		Microphone icon in audio tag recording mode.
		Battery level. Shading of the icon is proportional to the charge level.
		Memory state. Transparent - memory is free; Filled in completely - memory is almost full; Blinking - there is no space, or the SD card is not installed. Intermediate shading of the icon is proportional to the degree of filling the memory of the 4th shading stage. The icon may be simpler, as in the second picture, if the screen resolution is not sufficient to display fine details.
		GPS status: the inner circle is blinking - searching; the inner circle does not blink - fix2D; the inner circle does not blink, it is black - fix3D No icon - GPS module is turned off.
		Blinking - Bluetooth connection in progress or waiting for connection, Glows steadily - Bluetooth connection is established No icon - BT module is turned off

Device file system

Measurement results are stored in text files located in the PIMVDATA directory. Audio tags are located as separate files in the PIMVDATA/MEDIA directory and are sorted by date and time.

Each file contains in text format the measurements taken in one day. Appendix 2 provides the data file format.

PIMV File Manager

PIMV File Manager allows users to access the file system via Bluetooth. To install the software download it directly to the PC.

Connect PIMV device to PC via Bluetooth, the window will open with your device name (it will appear as PIMV + serial number of the equipment) (Figure 12)

Figure 12

Choose the folder, copy files to the computer using Ctrl+C and Ctrl+V. (Figure 13)

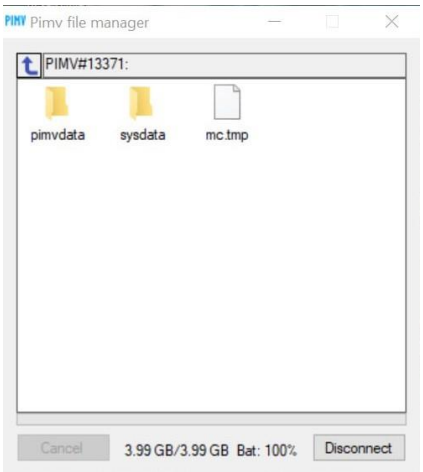


Figure 13

The full file management menu can be opened with the right click on the mouse or clickable area of the pc. (Figure 14)

Figure 14

Device repair

Warranty and post-warranty repairs are carried out at the manufacturing plant of GEODEVICE.

Storing the device

The device must be stored in the manufacturer's packaging at an ambient temperature of 5 to 40 ºC and a relative humidity that does not exceed 80% at a temperature of 25 ºC.

There should be no dust, acid and alkali vapors, aggressive gases and other harmful impurities that cause corrosion in the room where the device is stored.

Transportation

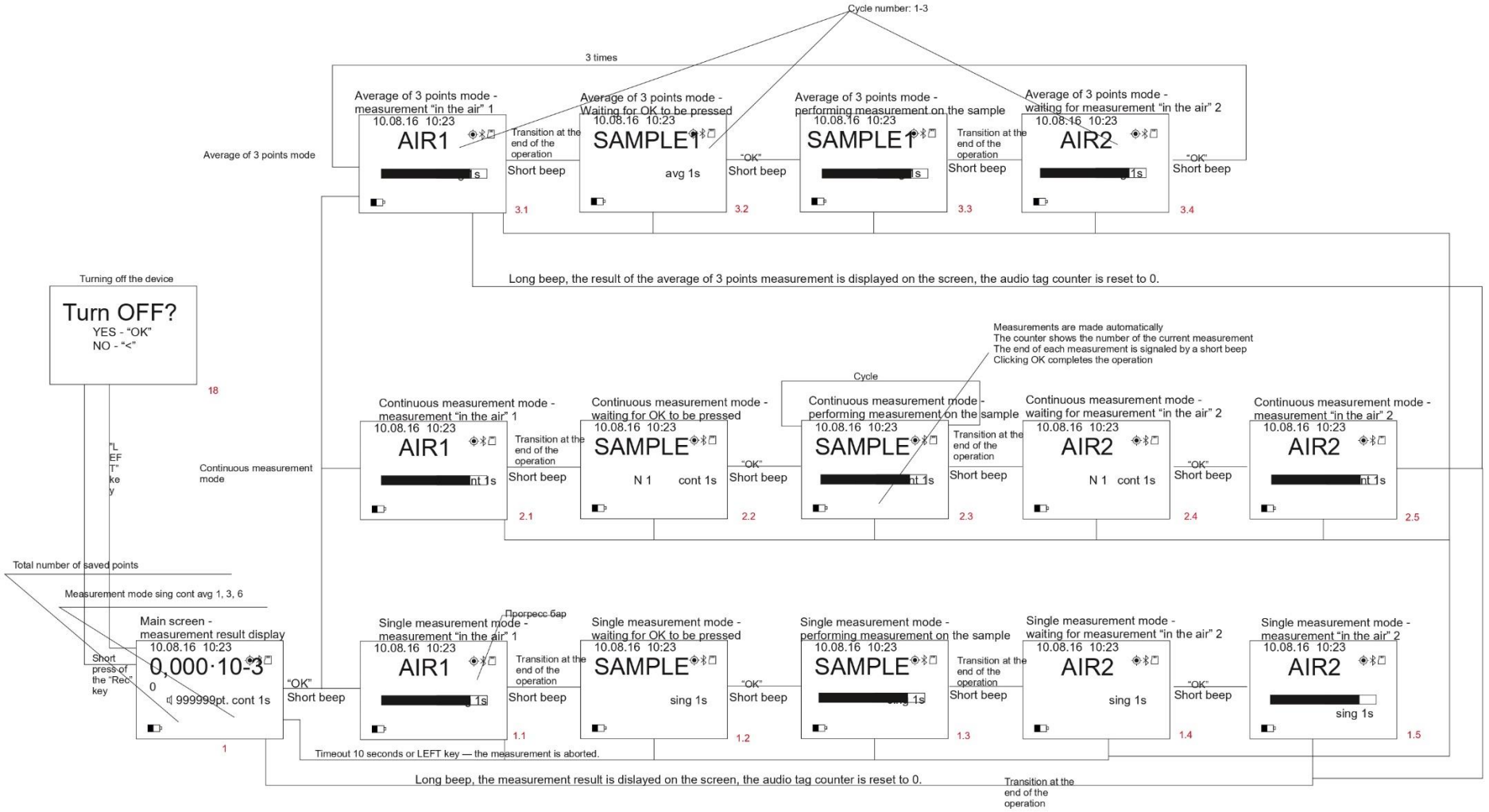
The device can be transported by any type of closed transport.

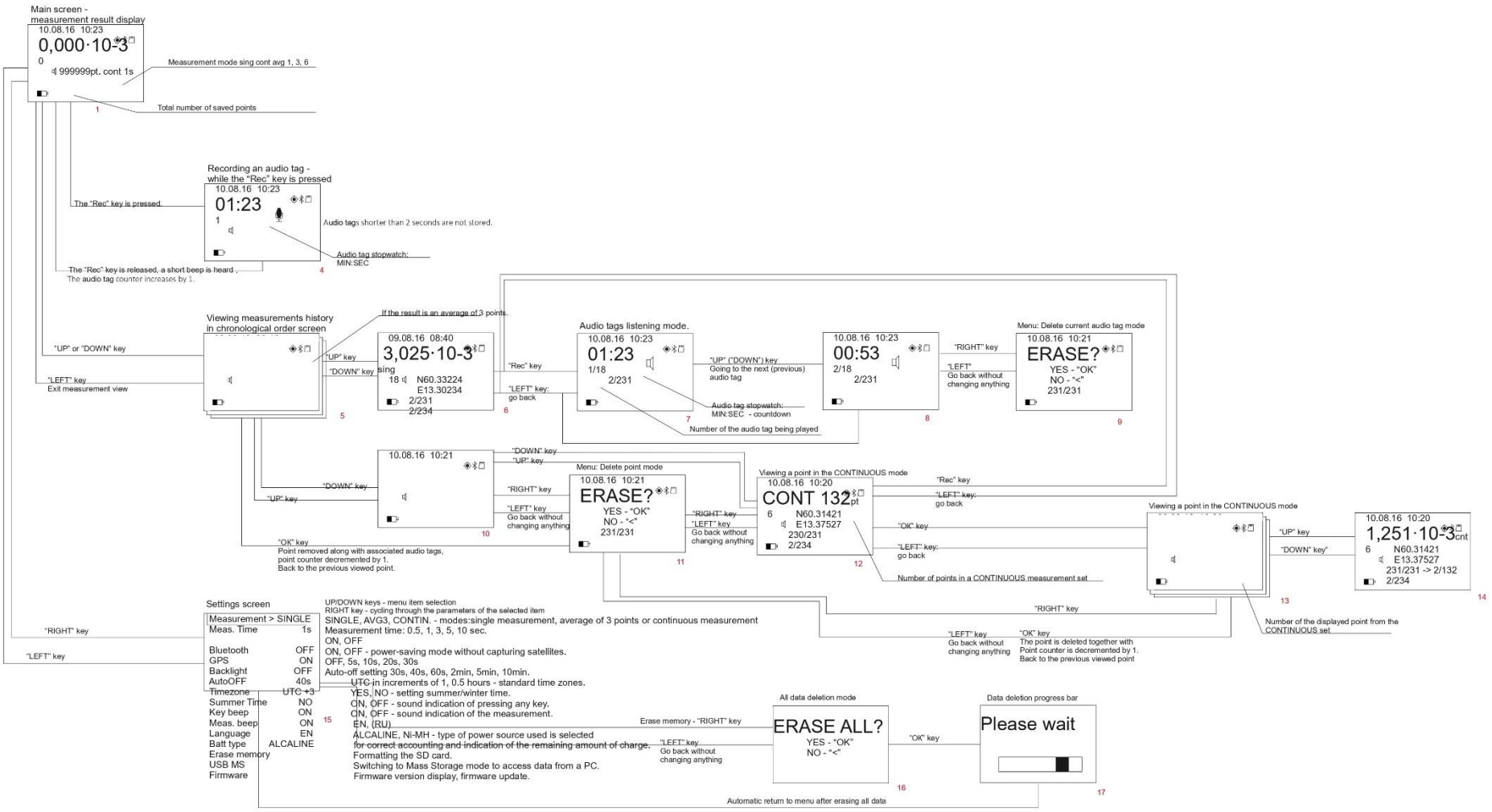
Notes:

1. When the device is transported by aircraft, it must be located in a heated sealed compartment.

2. Railway cars, ship holds, containers, car bodies used for transporting the device must not have traces of transportation of cement, coal, chemicals, etc.

Appendix 1: System of working screens of the device




Main screen - measurement result display
10.08.16 10:23
0,000·10-3
0
999999pt. cont 1s
Measurement mode sing cont avg 1, 3, 6
Total number of saved points
1
Recording an audio tag - while the "Rec" key is pressed
10.08.16 10:23
01:23
1
The "Rec" key is pressed
Audio tags shorter than 2 seconds are not stored.
Audio tag stopwatch: MIN:SEC
4
The "Rec" key is released, a short beep is heard , The audio tag counter increases by 1.
Viewing measurements history in chronological order screen
If the result is an average of 3 points.
09.08.16 08:40
3,025·10-3
sing
18 N60.33224
E13.30224
2/231
2/234
"UP" or "DOWN" key
"LEFT" key Exit measurement view
"UP" key
"DOWN" key
5
"Rec" key
"LEFT" key: go back
6
Audio tags listening mode.
10.08.16 10:23
01:23
1/18
2/231
"UP" ("DOWN") key Going to the next (previous) audio tag
Audio tag stopwatch: MIN:SEC - countdown
Number of the audio tag being played
7
10.08.16 10:23
00:53
2/18
2/231
8
"RIGHT" key
"LEFT" Go back without changing anything
Menu: Delete current audio tag mode
10.08.16 10:21
ERASE?
YES - "OK"
NO - "<"
231/231
9
10.08.16 10:21
"DOWN" key
"UP" key
"DOWN" key
"UP" key
10
"RIGHT" key
"LEFT" key Go back without changing anything
Menu: Delete point mode
10.08.16 10:21
ERASE?
YES - "OK"
NO - "<"
231/231
11
"OK" key Point removed along with associated audio tags, point counter decremented by 1. Back to the previous viewed point.
"RIGHT" key
"LEFT" key Go back without changing anything
Viewing a point in the CONTINUOUS mode
10.08.16 10:20
CONT 132pt
6 N60.31421
E13.37527
230/231
2/234
12
"Rec" key
"LEFT" key: go back
"OK" key
"LEFT" key: go back
Number of points in a CONTINUOUS measurement set
Viewing a point in the CONTINUOUS mode
13
"UP" key
"DOWN" key
10.08.16 10:20
1,251·10-3cnt
6 N60.31421
E13.37527
231/231 -> 2/132
2/234
14
Number of the displayed point from the CONTINUOUS set
"RIGHT" key
"LEFT" key Go back without changing anything
"OK" key The point is deleted together with Point counter is decremented by 1. Back to the previous viewed point
Settings screen
UP/DOWN keys - menu item selection
RIGHT key - cycling through the parameters of the selected item
Measurement > SINGLE
Meas. Time 1s
SINGLE, AVG3, CONTIN. - modes:single measurement, average of 3 points or continuous measurement
Measurement time: 0.5, 1, 3, 5, 10 sec.
Bluetooth OFF
GPS ON
ON, OFF
ON, OFF - power-saving mode without capturing satellites.
Backlight OFF
AutoOFF 40s
OFF, 5s, 10s, 20s, 30s
Auto-off setting 30s, 40s, 60s, 2min, 5min, 10min.
Timezone UTC +3
UTC in increments of 1, 0.5 hours - standard time zones.
Summer Time NO
YES, NO - setting summer/winter time.
Key beep ON
ON, OFF - sound indication of pressing any key.
Meas. beep ON
ON, OFF - sound indication of the measurement.
Language EN
EN, (RU)
Batt type ALCALINE
ALCALINE, Ni-MH - type of power source used is selected for correct accounting and indication of the remaining amount of charge.
Erase memory
Formatting the SD card.
USB MS
Switching to Mass Storage mode to access data from a PC.
Firmware
Firmware version display, firmware update.
15
"RIGHT" key
"LEFT" key
All data deletion mode
ERASE ALL?
YES - "OK"
NO - "<"
16
Erase memory - "RIGHT" key
"LEFT" key Go back without changing anything
"OK" key
Data deletion progress bar
Please wait
17
Automatic return to menu after erasing all data

Appendix 2

File format. The data in the file is presented in text form in the form of a table, where the columns are separated by spaces.

The line looks like:

[date] [time] [latitude] [longitude] [type] [period] [number of audio tags for this measurement] [measurement1] [measurementN]

Where

- [date] – Date when the measurement was taken in dd.mm.yyyy format.
- [time] – Measurement time for the current time zone in hh:mm:ss format.
- [latitude] – N/Ex.xxxxxx N/E – depending on the hemisphere: Northern or Southern. x.xxxxxx – latitude in degrees.
- [longitude] – E/Wy.yyyyyy E/W – depending on the hemisphere: Eastern or Western. y.yyyyyy – longitude in degrees.
- [type] – Measurement type SINGLE, AVG3, CONTIN – single, average of 3, continuous.
- [period] – 0.5, 1, 3, 5, 10 – measurement time (Meas. Time parameter)
- [number of audio tags for this measurement]
- [measurement1] [measurementN] – a single value for “single” or “average of 3 points” measurements, or space-separated values for a continuous measurement.

Audio tag files stored in the corresponding DDMMYY directory have the following names:

HHMMSSNN.wav – where DDMMYY is the date of the associated measurement, HHMMSS is the time of the associated measurement, and NN is the serial number of the audio tag 0-99.

+33 48 480-00-67 office@geodevice.fr Saint-Maximin-la-Sainte-Baume, France
+1 403 879-68-70 office@geodevice.ca Calgary, Canada
+7 727 344-32-82 office@geodevice.kz Almaty, Kazakhstan