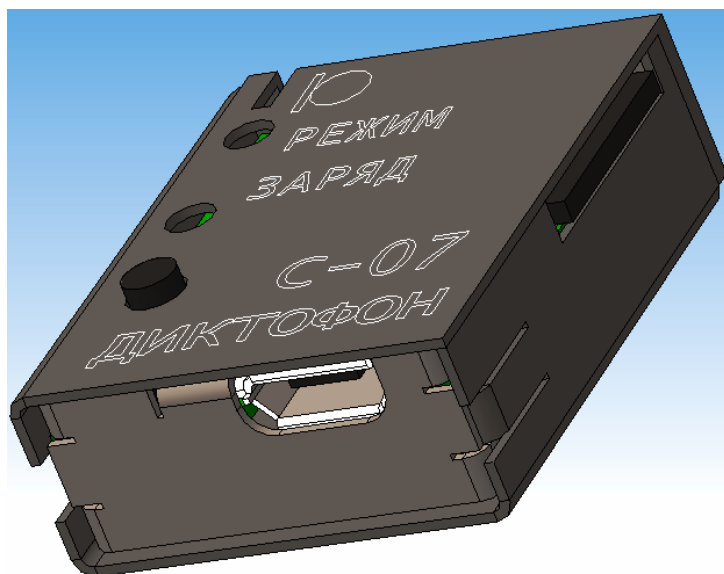


**DIGITAL VOICE RECORDER**  
**"SOROKA (FORTY) - 07"**  
**MANUAL**



**TABLE OF CONTENTS**

<b>1</b>	<b>PRODUCT SPECIFICATION AND DESCRIPTION OF THE VOICE RECORDER OPERATION .....</b>	<b>4</b>
1.1	Purpose of the voice recorder. ....	4
1.2	Basic specifications of the voice recorder are shown in Table 2.....	4
1.3	Light indication of operation modes and battery charging modes.....	5
1.4	Design and operation of the voice recorder.....	7
<b>2</b>	<b>USAGE OF THE VOICE RECORDER .....</b>	<b>8</b>
2.1	Operating limitations.....	8
2.2	Preparation of the voice recorder for usage.....	8
2.3	Charging of the internal accumulator.....	8
2.4	Setting up parameters of the voice recorder. ....	9
2.5	Usage of the voice recorder. ....	9
2.6	Creating a configuration file of the voice recorder.....	10
2.7	Decoding and verification of digital signatures of the files. ....	12
<b>3</b>	<b>LOGGER.....</b>	<b>14</b>
<b>4</b>	<b>CURRENT REPAIR OF THE VOICE RECORDER.....</b>	<b>16</b>
<b>5</b>	<b>STORAGE AND TRANSPORTATION.....</b>	<b>16</b>
<b>6</b>	<b>MANUFACTURER'S WARRANTY .....</b>	<b>17</b>

Operation Manual contains information on specifications, the device and the operating principles, the rules of storage, instructions for use and maintenance, necessary for the proper operation and full usage of the technical capabilities of the voice recorder "SOROKA (Forty)-07."



Fig. 1. Scope of delivery of the voice recorder "Soroka (Forty)-07."

Table 1. List of items supplied.

Name	Quantity	Footnote
1. Voice Recorder "Soroka (Forty)-07"	1	
2. Micro SDHC memory card	1	
3. Passport	1	
4. USB charging cable for the voice recorder	1	Cable type USB – micro USB
5. CD ROM disk with software and a set of software and manual	1	

## 1 Product specification and description of the voice recorder operation

### 1.1 Purpose of the voice recorder.

The voice recorder "Soroka (Forty)-07" is designed to record audio with the built-in digital MEMS microphone in mono regime to the micro SD memory card or micro SDHC Class4 or higher.

### 1.2 Basic specifications of the voice recorder are shown in Table 2.

Table 2. Specifications of the voice recorder "SOROKA (Forty) - 07."

No	Parameter		Description	
1	Dimensions		28x22.5x9.7	
2	Operating temperature range		-20 °C to +40 °C.	
3	Recording file format		«.WAV» uncompressed	
4	Type of memory and filing system		Removable memory cards micro SD, micro SDHC; FAT32 filing system	
6	Interface with PC		via micro SD card	
	Charger type		Cable USB – micro USB	
7	Discretisation of sound frequency		8 kHz, 16 kHz, 24 kHz, 32 kHz	
8	Resolution		16 bit, 20 bit.	
9	Microphone Sensitivity		-26 dBFS at 94 dB SPL (8-9 meters)	
10	Non-Linear Distortion Ratio		less than 3%	
11	Frequency range as per level - 3 dB	Discretisation frequency		
		8 kHz	3 Hz – 3.384 kHz	
		16 kHz	3 Hz – 6.768 kHz	
		24 kHz	3 Hz – 10.152 kHz	
		32 kHz	3 Hz – 13.536 kHz	
12	Duration of work, with the resolution of 16-bit (testing <b>Kingmax</b> memory card to <b>16 GB 10 cl.</b> )	Discretisation frequency	Typical operating time (hours)	Not less than * (hours)
		8 kHz	59	36
		16 kHz	39	24
		24 kHz	30	18

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		32 kHz	23	14
<b>13</b>	Duration of work, with the resolution of 20-bit (testing <b>Kingmax</b> memory card to <b>16 GB 10 cl.</b> )	Discretisation frequency	Typical operating time (hours)	Not less than * (hours)
		8 kHz	49	30
		16 kHz	31	19
		24 kHz	22	13
		32 kHz	17	10
<b>14</b>	Suppression outside the band of operating frequency range while tuning an octave		at least 60 dB	
<b>15</b>	Average life of the voice recorder		For at least 2 years	
<b>16</b>	Average storage time of the voice recorder		not less than 2 years, with the implementation of discharge / charge cycle every three months	
<b>17</b>	Battery charge time		Not more than 3 hours	
<b>18</b>	Function of real-time clock		Yes	
<b>19</b>	Function of work as an alarm clock		Yes (up to 10 alarms)	
<b>20</b>	File encryption function		Yes	
<b>21</b>	The digital signature of files function		Yes	
<b>22</b>	Mode of voice operated switch (VOX)		Yes	
<b>23</b>	Ability to manually control the recording level		yes (only 16-bit only with resolution) ; from -12 dB to +18 dB with step 6 dB.	
<b>24</b>	Mode of automatically adjusting the sound level		Yes (only 16-bit only with resolution); from -12 dB to +18 dB with step 6 dB.	
<b>25</b>	Logger		Yes	

**\* Minimal time of operation of the voice recorder is due to loss of battery capacity by 40% in the aging process, or at low temperatures.**

### 1.3 Light indication of operation modes and battery charging modes

Light indication of operation modes and emergency crashes of the voice recorder is shown in table 3.

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Table 3. Light indication of modes and emergencies.

<b>Modes and emergency situations of the voice recorder</b>	<b>Status of Indicator "Mode"</b>
a) Getting started (when the recorder is being switched on by the user)	<p>1. In normal recording mode, indicator turns green and stays so until the end of the process of opening the file (duration of opening of the file depends on the size of the opened files and free space on the map). After opening the file locator indicator "Mode" repeatedly flashes green, or if the accumulator, red. A further indication is only possible by pressing a button.</p> <p>2. If using a memory card file "<i>dict.ini</i>" and it is tasked for the alarm clocks, the indicator lights up for 1 second green and the voice recorder enters standby mode by switching the alarm. A further indication is only possible by pressing a button.</p> <p>3. If the recorder is set up to operate as voice operating switch, the indicator lights for one second green, and then lights up for one second orange. A further indication is only possible by pressing a button.</p>
b) Mono recording mode (after the brief pressing of control button)	<p>1. If the battery voltage is normal, the indicator repeatedly blinks green.</p> <p>2. If the battery is low, the LED blinks several times in red.</p>
c) Recording mode with voice operated switch (VOX) (after a brief pressing of a button)	After detecting the audio signal of the preset level, similar to normal mode
d) Mode to record audio signal as per an alarm clock (after brief pressing of the button)	Indicator repeatedly blinks slowly in red and green colors, independently from the other recording modes and battery status.
e) Standby mode for alarm clocks (Short time after the brief pressing of the control button)	After brief pressing the button, triple-time winking red and green of indicator will happen.

f) Emergency - incorrect filing system, the lack of a memory card or fault-of memory card	After switching on of the voice recorder, indicator light turns green, and then - lights red, then the voice recorder turns off
g) Status "No free space on the disc"	Indicator after turning the voice recorder on, continuously glows green for some time (depending on the size of the micro SD and size of file being created), then the voice recorder turns off.

Light indication of charge modes of the internal accumulator is shown in Table 4.

Table 4. Light indication modes of the internal accumulator of the voice recorder.

Charging modes	Indicator Status "Charge"
a) The end of the charge of the internal accumulator	Indicator "Charge" lights green
b) the charge of the internal accumulator	indicator "Charge" lights red

#### 1.4 Design and operation of the voice recorder.

The outlook of the voice recorder "Soroka (Forty)-07" is shown in Figure 2.

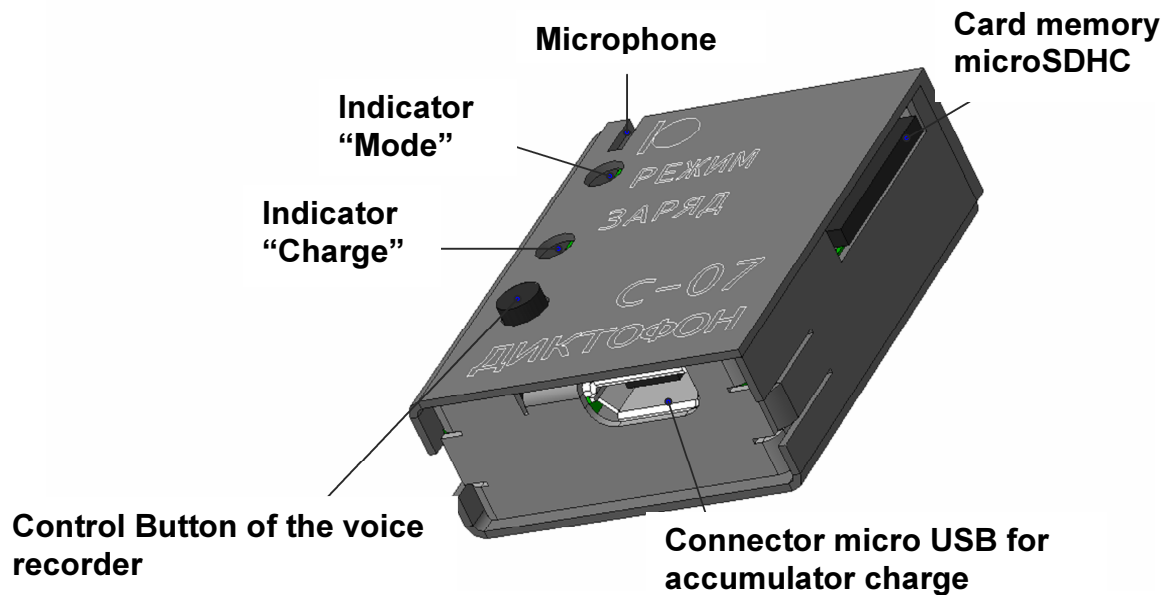


Fig. 2. The outlook of the voice recorder "Soroka (Forty)-07."

## 2 Usage of the Voice Recorder

### 2.1 Operating limitations.

To avoid the voice recorder failure, observe the following rules:

a) charging internal accumulator of the voice recorder should be carried out only from USB port of your computer;

b) **Protect the voice recorder and external microphones from mechanical shocks – severe bumps may lead to possible destruction of the microphone.** If the voice recorder received mechanical damage during operation and this led to its failure, it is not covered under warranty any more.

c) Do not allow dust and moisture on the microphones, as it can lead to significant deterioration in the performance of a digital microphone.

### 2.2 Preparation of the voice recorder for usage.

It is strongly advisable to read carefully this Manual before starting to use the voice recorder.

Before starting to use the voice recorder, it is necessary to carry out an external inspection for mechanical damage. On the surface, there should be no cracks, chips, dents. Metal parts should not have any traces of corrosion.

Before the work, it is necessary to configure the voice recorder parameters according to chapter 2.4 of this document.

To check the length of work of the voice recorder as shown in Table 2.

To check the operation of the microphone, having made test recordings and having listened to them on your computer.

### 2.3 Charging of the internal accumulator

Connect the USB cable to the voice recorder and then plug it into the USB port of your computer.

If the accumulator of the voice recorder is discharged, the indicator "Charge" will light up red. Once fully charged, the battery indicator "Charge" will turn green. The charging time of a fully discharged battery is approximately 2 hours.

***Attention! If you want to keep the voice recorder for storage for over than 1 month, firstly, completely discharge it and then charge for 30 minutes.***



### 2.4 Setting up parameters of the voice recorder.

Insert the micro SD card into the card reader. Format the micro SD under the filing system FAT32.

Create a folder with any name on your computer.

Copy the **dict.exe** program from the supplied CD disk into the created directory.

Run **dict.exe** program into the created directory and follow chapter 2.6 of this document, create a configuration file named **dict.ini**.

Write down the created file **dict.ini** to the memory card.

Insert the memory card into the voice recorder and switch it on. The voice recorder will read configuration file and **save** it to the internal memory. After reading the settings from the file, the voice recorder will **automatically remove** it and **continue to work in a user-defined mode** (indication as shown in Table 3).

Usage of the voice recorder.

### 2.5 Usage of the voice recorder.

Insert the formatted under FAT32 micro SD card into the voice recorder.

Turn on the voice recorder by pressing the control button for 2 seconds. After turning on, the voice recorder enters the operating mode which has been set by the user at the last setting.

To **display the current status** of the voice recorder, briefly press the control button. The current state is determined according to the indications on the table. 3.

To switch off the recorder, press the control button and hold it down till the mode indicator stops flashing and goes out (indicator must either begin to turn solid green, or goes off). Moreover, if the operation has been set for the alarm clock, the operation of all alarms is canceled.

After switching off the voice recorder, remove the memory card from it and insert it into a card reader. To decode the recorded files and verify their digital signatures, use the tab "Decoding and verifying files integrity" of the program **dict.exe**. When using program, please, read chapter. 2.7 of this document.

To listen to the audio files produced, use any player that supports "WAV" format (recommended is SOUND FORGE version 6.0 and later).

### 2.6 Creating a configuration file of the voice recorder.

Run **dict.exe** program and select in the opened window tab "Setting up the voice recorder", as shown in Fig. 3. This tab is used to create / read files **dict.ini** and contains the following parameters and options:

a) **Enable / disable voice activation of the voice recorder.** Activating this mode of the voice recorder, it starts recording in case, when the audio level exceeds a predetermined threshold. If the audio level is below a predetermined threshold for 5-minute, the voice recorder stops recording and enters the standby mode of the acoustic signal. When resolution of 16 bits, the user can change the threshold for the recorder by selecting the desired level of sound amplification. When resolution of 20-bit covers the voice recorder activation threshold is fixed and defined by the manufacturer of the voice recorder. The choice of this mode disables the automatic audio level adjustment. The names of the files recorded in voice activation mode will begin with the word «VOX\_».

b) **Enable / disable the automatic adjustment of the volume level** After activating this function, loud sounds will be attenuated and quiet, on the contrary, increase. That will automatically align the level of by-writes of an audio signal. It is only available for recording with resolution of 16 bit (20 bits cover the entire dynamic range of the audio signal and the audio level adjustment is not needed).

c) **Setting of the fixed gain level of the sound.** If the user or the program itself switched off automatic, adjustment of the sound level, it is necessary to set optionally available series of audio signal gain value. Function is only available for recording audio bit depth of 16 bits (20 bits cover the entire dynamic range of the audio signal and the audio level adjustment is not needed).

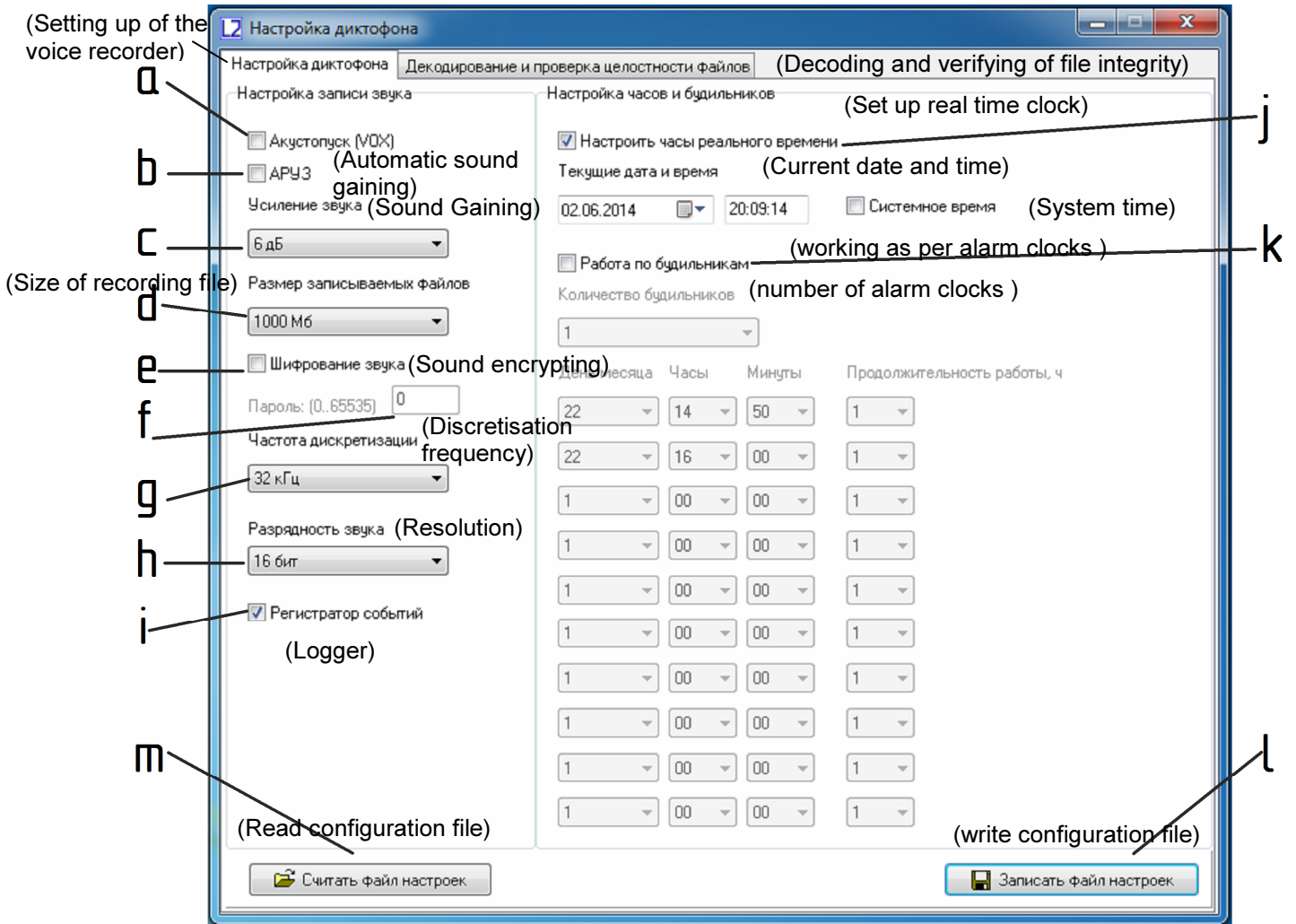


Fig. 3. Tab "Setting the recorder" program dict.exe.

d) Setting up the size of the recording files. In this window, the user must select the size of the files being recorded on the card from the following series: 50 Mb, 100 Mb, 250 Mb, 500 Mb, 1000 Mb, 1800 Mb.

e) Enable / disable encryption of audio files. User can enable this feature if it is necessary to eliminate the possibility of non-authorized interception and change of the recorded information on the map. All encrypted files will have the extension ".xxx."

f) Set up a password to encrypt the audio files. After activation of the encryption function, the program will ask to set up a password in the range from 0 to 65535, inclusive. The user must remember this password, otherwise, recorded and encrypted files will not be suitable for usage.

g) The choice of the discretisation frequency. Possible values are 8 kHz, 16 kHz, 24 kHz and 32 kHz. The higher the discretisation frequency rate, the better the quality of recording audio files, but shorter the battery life of the voice recorder.

h) The choice of resolution. Possible values are 16 bits and 20 bits. Resolution of 20 bit allows you to record audio without limiting its dynamic range, but reduces battery life (off-line work) of the voice recorder.

i) Switching logger on / off of the voice recorder. With the switched on logger all the main events will be recorded to the internal memory of the voice recorder, as

well as their time and date. When you switch off the voice recorder in standard manner, the last 48 events will be copied to the memory of the microcontroller to the microSD file INF\_REG.TXT.

j) To set up the current time and date. To change the date and time in the filing system of the voice recorder, select flag "Set up real-time clock." To use the current system time, leave the set up flag "System Time." To set the date and time manually, this flag should be removed.

k) Enable / disable the timers operation. To switch the voice recorder on at strictly fixed time and let it work for a certain period of time, it is necessary to select flag "Work on the alarm clocks." Then necessary number of alarms is selected in the window "Number of alarm clocks", depending on the desired number of actuations of the voice recorder. To initialize each of the alarm clocks it is needed to set up the date (day of month) and time, as well as the work duration of this alarm, after which the voice recorder will turn off and wait for the next turn on of the next alarm clock. Alarms operate in sequence from the first to the fifth. The voice recorder turns itself off after the run of the last alarm.

l) Save the settings file. After setting up the desired configuration of the voice recorder, click the button "Save the settings file." The program will create a new one or overwrite an existing configuration file to the directory dict.ini. Copy the created file dict.ini to the microSD card, which you use and switch on the voice recorder.

m) To read the configuration file. If it is necessary to read the contents of a previously created configuration file, click "Read configuration file" and choose directory for reading the file dict.ini.

### 2.7 Decoding and verification of digital signatures of the files.

Run **dict.exe** program and select the tab "Decoding and verifying files integrity", as shown in Fig. 4. This tab of the program is designed to work with encrypted files and verification of digital signature of the needed file.

***Attention! The decoding process of large files can take sufficiently long time. To speed up the decoding process, it is recommended initially to copy encrypted files to a computer.***

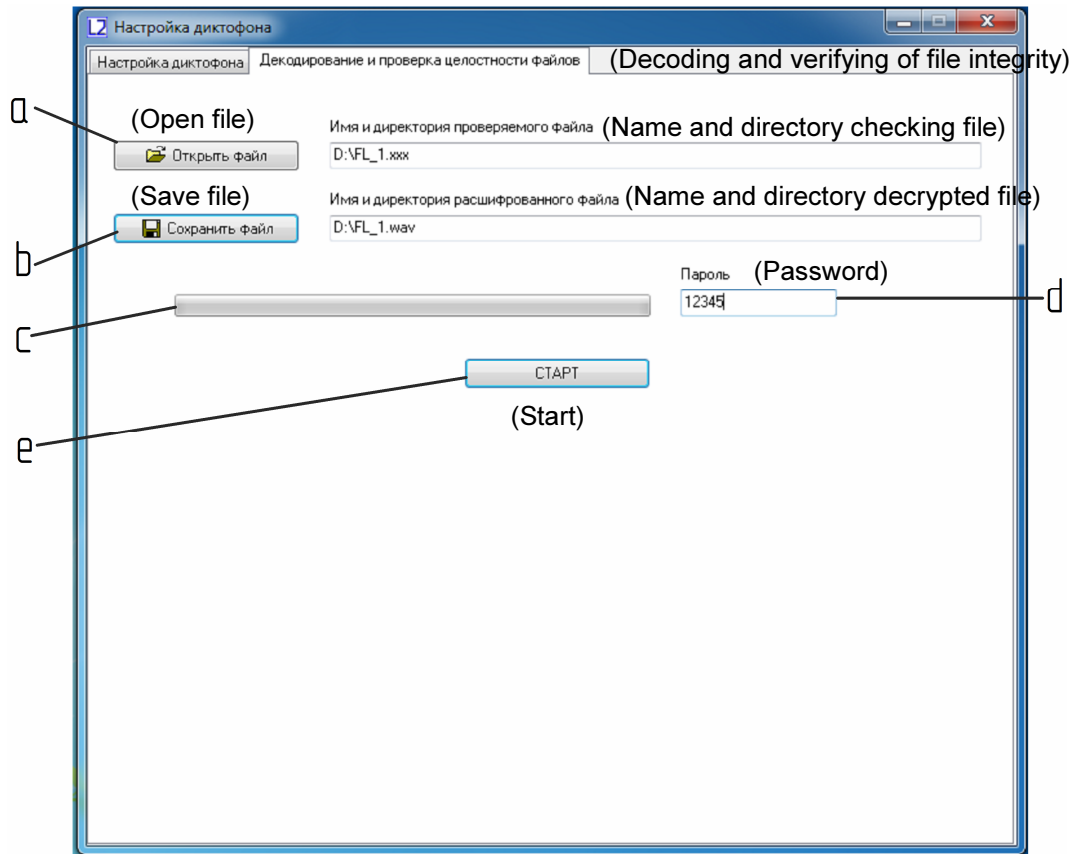


Fig. 4. Example of verifying of the digital signature of files and their decoding.

In the tab "Editing and checking the integrity of the file" there are the following controls:

- a) **Open the file.** Click "Open File" and select the desired directory and file. After selecting the desired file, the program automatically will determine according to the **extension** of the file, whether it is encrypted or not. If the file is not encrypted, the program will only perform checking of its digital signature.
- b) **Save the file.** If the file is encrypted (has the extension «.xxx»), the program will prompt the user to enter the name and directory of the file, where the decoded audio will be recorded, as well as the password (see. 2.6 (f)). Once the file is created with the decoded audio recording, the program will automatically move to checking of its digital signature.
- c) **Indicator of the progress of decoding and calculation of the digital signature.**
- d) **The password for the encrypted files.**
- e) **Button "Start" / "Stop".** By pressing the "Start" button, decode of file and checking its digital signature runs. During decoding of the file, button "Start" changes its value to "Stop". By pressing the "Stop" button, the decoding process stops.
- f) **The output of result of the integrity file check to the screen.** At the end of the file checking, the program will show the message "The digital signature is valid". It will happen in case, that the continued integrity of the scanned file is present. If file contains errors in recording, the program will display the message "The digital signature is not valid!". Also, for each file, the number of the

voice recorder on which it was recorded is shown (Fig. 5).

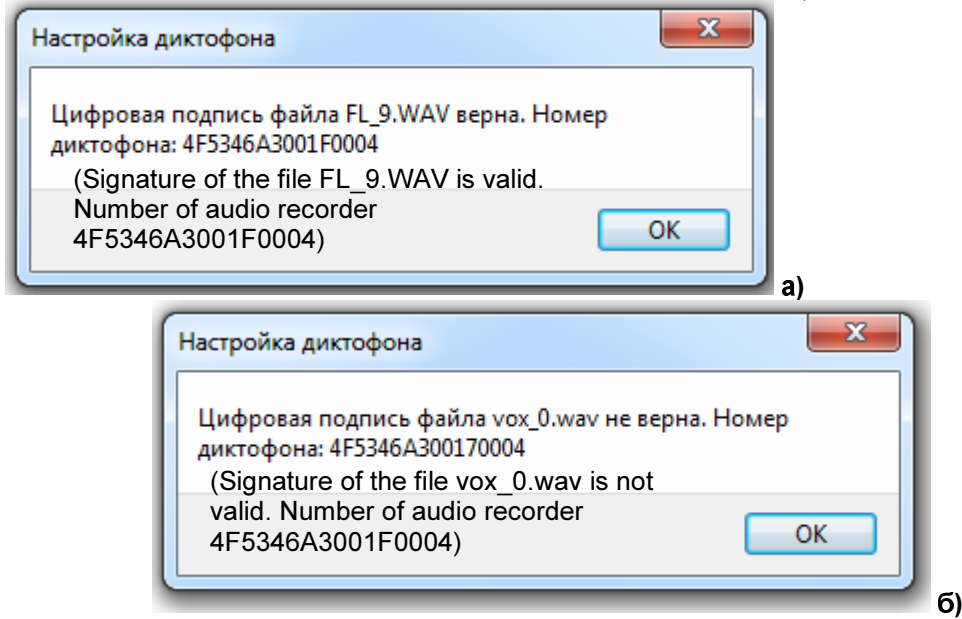


Fig. 5. Output of files test results: a) a digital signature of the file is valid; б) Digital signature of the file is not valid.

### 3 Logger.

- 3.1 Logger is designed to capture in the non-volatile memory of the voice recorder highlights of the voice recorder's work, as well as all emergencies.
- 3.2 Logger stores from 32 to 48 last events, as well as their time and date, when they occurred.
- 3.3 If the logger is turned on (see. 2.6 (i)), then if the voice recorder is switched off (except crash reset) logger is recorded to micro SD into the file INF\_REG.TXT.
- 3.4 It is not recommended to use the logger continuously since this reduces resource of nonvolatile memory of the voice recorder (it only affects work of the logger itself).
- 3.5 Brief description of the recorded events and the structure of the registrar is given in Table 5.

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Table 5. Description of tags and events of registrar.

Shorthand	Description
DEVICE_NUMBER	Identification number of the voice recorder
POWER_RESET	Reset by power failure
PIN_76_RESET	Processor hardware reset
PMMSWBOR	For official purposes
WAKE_UP_FROM_LPX.5	For official purposes
SECURITY_VIOLATION	For official purposes
SVSL	For official purposes
SVSH	For official purposes
SVML_OVP	For official purposes
SVMH_OVP	For official purposes
PMMSWPOR	For official purposes
WATCH_DOG_TIME_OUT	Looping / stop of the processor's program due to not serviceability of card or software failure
WDT_PSWRD_VIOLATION	For official purposes
FLASH_PSWRD_VIOL	For official purposes
PLL_UNLOCK	For official purposes
PERF_AREA_FETCH	For official purposes
PMM_PSWRD_RESET	Forced software reset (occurs when overwriting Voice Recorder microprocessor program). Is called forcibly.
LOW_VOLTAGE_TURN_OFF	Low Battery - The recorder is turned off
BUTTON_TURN_OFF	Voice Recorder is turned off by pressing
BUTTON_TURN_ON	Turning the voice recorder on by pressing
SD_MEMORY_IS_OVER	No free space on the microSD - the voice recorder is switched off
ALARM_TURN_OFF	Voice recorder is turned off by timer
ALARM_TURN_ON	Voice recorder is turned on by timer
SD_READ_TIMEOUT	Micro SD does not respond to a command to read data
SD_WRITE_FAILURE	Command to record data do not pass to micro SD
NO_SD_BLKWR_RESPONSE	It is not confirmed by microSD on the recording data block
PROGRAM_BOR_RESET	Complete reset of the voice recorder. Called of forcibly, if the voice recorder has not detected a microSD memory card or if the memory card of filing system contains errors.
SNMI_INTERRUPT	Microprocessor system failure (it is necessary to save the file INF_REG.TXT)
FLASH_ACCESS_ERROR	Error of the program (it is necessary to save the file INF_REG.TXT)
OSCILATOR_FAULT	Hardware failure of the oscilator
NMIFG_INTERRUPT	Microprocessor system failure (it is necessary to save the file INF_REG.TXT)
EMPTY_CELL	empty cell
UNDEFINED_ERROR	Unspecified error or reset

## 4 Current repair of the voice recorder

### 4.1 General instructions

If any defect of the voice recorder is detected, repair works are needed. Current repairs of the voice recorder should be made at the factory or in the workshop.

**Attention !!!** Unauthorised opening of the voice recorder leads to the removal of the warranty from the voice recorder.

### 4.2 Typical faults

Typical faults of the voice recorder, which may be eliminated in the operating organizations are shown in Table 6.

Table 6. Typical faults of the voice recorder, and their solutions.

<b>Faults</b>	<b>Methods of correction</b>
The voice recorder doesn't switch on	To charge the storage battery
Recorded on the voice recorder audio files contain errors or are not readable	Replace the memory card. If this does not work, then contact the service center.

## 5 Storage and transportation

5.1 The Voice Recorder should be kept in its original packaging in heated storage rooms at a temperature ranging from +5 to +25 C with relative humidity less than 80% (at + 20 C). The environment must be free from pairs of acids, alkalis and other aggressive impurities.

5.2 The Voice Recorder in special packaging may be transported in closed transport (rail cars, containers, closed type holds of water [sea or river] modes of transport), as well as in sealed cockpits of planes and helicopters.

### **Attention!**

**If you want to keep the recorder for storage for over than 1 month, firstly completely discharge it and then charge for 30 minutes.**

**Li-polymer batteries in poorly charged state have the smallest loss of their capacity while storage!**

**Avoid storing the voice recorder in premises with air temperature over 25 C.**



### **6 Manufacturer's warranty**

- 6.1 The manufacturer guarantees the accordance of the voice recorders to the technical requirements, providing that the customer obeys instructions for operating conditions, transportation and storage, set up by this manual.
- 6.2 The warranty period is 12 months within the warranty period of storage.
- 6.3 The warranty period of storage is 18 months from the date of production, if the charge / discharge cycles of the battery are held every 3 months.
- 6.4 The warranty period is extended for the period of warranty repairs, if any.
- 6.5 In the event of defects, discovered in the voice recorder due to the manufacturer's fault within the warranty period, troubleshooting, to the point of replacing of the voice recorder itself and its constituent units, are made at the manufacturer's expense.