



Ver.mob
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Quick start

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Introduction

PianoLabM – is the program for tuning for Android 4 and above smartphones and tablets.

Program site: www.pianolab.ru

In program it is possible to use two kinds of representation of the information on the screen (configurations):

- **H**(only harmonics)
- **HFS**(harmonics, frequencies and a spectrum)

Configuration **H** is more convenient for devices with small screen - 4-6 inches, and more informative configuration **HFS** - for devices with the big screen - 7-10 inches.

After the program is installed, the default configuration of the **H**.

The configuration choice can be made after start of the program of the menu by button **M**. Select the option **Settings** and then, change the configuration type(**HFS**) – **H** or **HFS**.

After change of a configuration the program should be restarted!

The parameters established by default

Are recommended for the initial stage of use (development) of the program as provide a comprehensible parity between quality of processing of an entrance signal and requirements to capacity of the processor of the computer:

1. Configuration type - **H**

2. Type of temperament – standard equal temperament (**ET**). In the program it is realized two kinds of temperament:

- usual **ET**, with interval coefficient $2^{1/12}$. For a zone temperation the range from **A3** to **A4** undertakes.
- **ET the Stopper(ETs)** with interval coefficient equal to $3^{1/19}$. For a zone temperament the range from **D3** to **A4** undertakes.

3. Frequency of base note **A4** - is by default equal **440Гц**.

4. Frequency of digitalization. By default - **8000** that corresponds to the maximum frequency of an analyzed signal - **4000** Hz (the Note F#2). If it is necessary to tune higher notes, it is necessary to increase frequency of digitalization. The choice of frequency of digitalization in the program is limited by standard values - 8000, 11025, 16000, 22050 and 44100.

5. Size of the block of the analysis of transformation of Fourier - **32768** (32к). At frequency of digitalization equal **8000** and size of the block of the analysis - **32к** the spectral resolution is equal **0.2** Hz. This is roughly equivalent to one beat in **5** seconds. If such accuracy does not suffice, it can be increased, or reducing frequency of digitalization, or increasing size of the block of the analysis.

6. Time. By default - **200мс**. A range of change from **100** to **1000мс**. This parameter defines, how there will be a spectrum updating. If capacity of the computer has not enough for the chosen value of time distortions of a spectrum in the form of rectangles are possible.

The description of configuration H



From top to down on a vertical:

The top row of buttons

- Button **A** - On/Off AutoDefinition of note.
- Button **W** - On/Off the permission of record of the note.
- Button  - On/Off / snapshot of current note.
- Button **M** – call the popup menu.
- The Information field - for displaying of messages of the program. By pressing displayed out:
 - B1 - Base1(the left bound of temperament zone)
 - B2 - Base2(the right bound of temperament zone).
 - A4 - Frequency of the base note.
 - T - Time interval in mc through which the screen is updated .
 - Fs - Frequency of digitalization.
 - FFTsz - Size of the block of the analysis of Fourier transformation.
 - Sres – Value of the spectral resolution in Hz.

Horizontal graphic bar

Displays the level of the envelope in dB. You can change it by sliding your finger to the bar.

A numerical row

- The estimated (desired) frequency of the 1st harmonic of the note.
- Real frequency of 1st harmonic of the note.
- Averaged (on five harmonics) a deviation of real frequency from calculated in cents.

The note. The first number is highlighted always, the second and the third - only when in a signal spectrum all five harmonics of the given note are defined.

Scale of a deviation of real frequency from calculated in cents

Depending on deviation size, the price of division of a scale can be or 10 cents or 1 cent. In the first case the graphic strip of a deviation has green color, in the second - bright green. If the note is not distinguished in a spectrum or the signal is too weak and lies below bending around the strip is not displayed in general. The deviation scale is analogue of the stroboscope applied in some programs of tuning.

The name of the current note

Illumination of the note name can change, depending on a condition of the analysis of the note in a spectrum:

- Illumination is absent - the current note is not distinguished in a spectrum.
- Illumination of green color - the initial stage of an identification of the note.
- Illumination of bright green color - the note is distinguished.

The bottom row of buttons

- Buttons ,  octave and note change to the left.
- Buttons  /  - start/stop of input and the analysis of a sound signal.
- Buttons ,  note and octave change to the right.

The popup menu

The same for all configurations, is caused by pressing M:

- **RC** - start of the module of calculation of optimum frequencies for a temperament zone.
- **PianoKeys** - is displayed the keyboard of two octaves - small and the first.
- **Settings** - a call of a window of change of options of the program. Here it is possible to adjust some parameters of processing of an entrance signal and spectrum visualization. The parameters exposed by default, are sufficient for adjustment of average accuracy. In this case accuracy of definition of frequencies of notes will be approximately equal 0.2 Hz. (0.8 cents for an average part of a range) or 1 palpation for 5 seconds.
- **Reset** - initialization sound scale from **C0** to **B7** according to a principle equal temperament, i.e. frequencies of the next notes decrease or increase in $2^{1/12}$. As the base note the note **A4** undertakes. If it is chosen temperament on the Stopper for interval factor $3^{1/19}$ undertakes.
- **Beep** - the signal-generator - is synthesized a sinusoidal sound signal with the frequency equal to frequency of the first harmonic of the current note together with 5 harmonics.
- Window of **Rajlsback**.
- Window of **inharmoniccity**.
- Window of **intervals**.
- **Open** a file.
- **Write** file.
- **Registration** - the information on the program status, serial number and the activation button.
- **End of program**.

The work beginning.

Program start.

The use of the program is focused on the landscape position of the device, so before starting the program, the device need to rotate at this position. Turns after starting the program, do not run!

After program start it is necessary to wait about 2 seconds. This is the time required for the build envelope of the background noise. In the info window is given a cycle number and at the end of the formation of the envelope of the message "End ..." stands out.

At this time it is not recommended to make noise!

Check of input of a sound signal

Press the button 

If in the conditions of silence, the information on the screen constantly changes, this means that the amount of the adjustment, the noise envelope is too small and the program finds in the background noise components of the current note (**A4**). In this case you need to increase this setting by changing the value in the graphical strip in the upper part screen. This is done by moving your finger horizontally at the top of the screen along the green strips. Allowable adjustments from **0** to **100**. You need to ensure that in the conditions of silence, the information on the screen did not change.



The note. If the value of the in-band envelope level too high any signal, including a useful will be discarded.

Press key A4. The screen should look something like figure and needs to respond to the microphone.

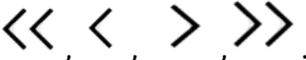


Here:

- The calculated frequency for the key pressed(A4) is 440 Hz.
- Real, identified in a signal, frequency of 440.9 Hz.
- The Deviation in cents - +3.8c.

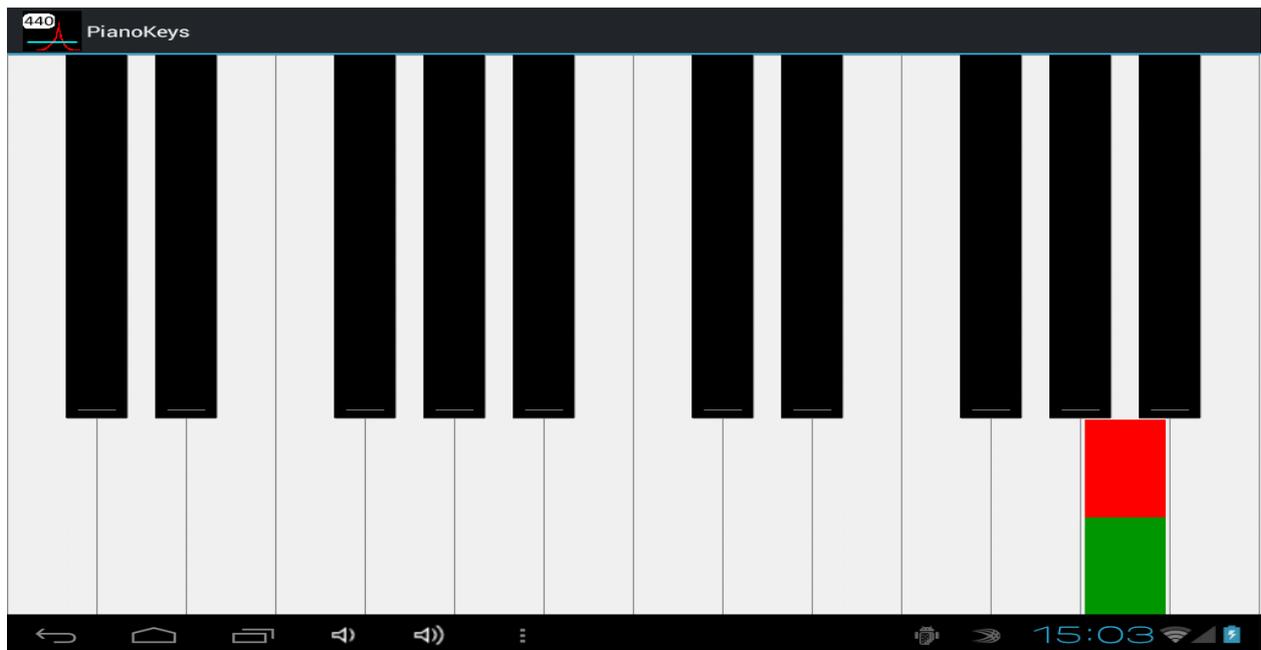
If deviation size as in our case, does not exceed 5 cents color of a graphic deviation and the note name - bright green and the price of division of a scale 1 cent. If the size of a deviation is more than 5 cents color of a graphic deviation and the note name - green and the price of division of a scale is equal to 10 cents.

How to enter notes when tuning up.

1. Press the button  **start**.
2. Choose the necessary note pressing of corresponding buttons
 .
3. Press a corresponding key on a piano.

On **start** process of input of a sound is started. The input sound is analyzed in the program and if in it is possible to define the current note, on the screen frequency of the note and its deviation from settlement in cents stands out.

4. Press button  (ex) . By pressing this button, process of input of a sound and displaying information on the screen are stopped, and frequencies of the chosen note are **stored, under condition of inclusion of flag W**. If the record of note was fine, it issues a short beep. To check up what notes were are kept, it is possible on an option "**Keyboard**" from menu **M** - two octaves are highlighted.



The current note is highlighted in red, and the recorded notes of green rectangles.

Tuning zone temperament with use of an automatic finding of the plan of tuning.

Procedure of tuning with use of an automatic finding of the plan of tuning consists in the following:

1. Choose type temperament: usual **ET** or **ET by Stopper**.
2. It is checked in options frequency of the base note **A4**, usually this frequency is equal **440** Hz.
3. Then it is necessary to enter all notes of a zone temperament, by default, it is a range from **A3** to **A4** inclusive for usual **ET** (for **ETs** on Stopper **D3 – A4**). Flag **W** should be **On**.
4. After that, we start process of search of the decision - option **RC** in the menu.
5. If the solution exists, calculated values for temperament zone notes will correspond to the found plan of tuning.
6. Now it is necessary to change only, each note tension of a zone trying to reduce a deviation of real frequency from the calculated.

The note. The solution is sought so that the beats in quarts, fifths, thirds and sixths fall in a certain interval, and the difference between 2nd harmonic of **A3** and 1st harmonic of **A4** would be minimum (for **ETs** on the **Stopper** the difference between 3rd harmonic of **D3** and 1st harmonic of **A4** is minimized). If the solution exists, in the field of Messages the line that the decision is found with instructions of frequency of the bottom note of a zone температуры stands out.

The solution may not exist for all restrictions or, in the case where one or several notes are significantly different in frequency from the values initialized scale.