TG MANUAL.
OPEN SOURCE TIMING SOFTWARE.
Oscillo-Escape

The origin of the watch timing machine.
We call a "**timing machine**" a device that allows, in its most basic function, to determine the performance of a mechanical or electromechanical clock, and to establish the gaining or losing rate at a given moment.
Here we have a patent register of one of these devices or devices. Https://www.google.com/patents/US2155646

The first devices of this sort appeared around 1935. Let's say they were electronic devices.

There were several manufacturers including American and European.

Its principle has been the same. A stable and known standard is used as a reference and is used to determine the deviation of a mechanical watch.

With respect to tg Timing Software, the software designer uses the hardware of a processor or computer and has created a program with advanced algorithms that allow not only to determine the deviation of the march, that is to say it's the gaining or losing rate, but also other important parameters In the analysis of a mechanical watch. These are the "Beat Error", and "the amplitude of the balance wheel".

What is tg Open source timing software?
TG Timing Sofware is an application designed to help watchmakers, determine the state and performance of a mechanical watch that has the Swiss Lever anchor system as an escape design, but can easily determine the operation of other types of escapement like the escapement type Roskopf. https://en.wikipedia.org/wiki/Pin-pallet_escapement

What do you need to work on tg Timing Software?
• A computer or computer.
• A microphone or vibration sensor
• A preamplifier
• Basic knowledge of watchmaking.

COMPUTER
The computer can be a hardware of about 10 years old. We have worked with Windows 7, Windows 8, and Windows 10. It is certain that most computers around 5 years old will work in an acceptable way.

THE MICROPHONE.

This is the part where there is usually a bit of difficulty. The tg software is extremely efficient even when working with conventional microphones. However given the characteristics of the clock sound, a relatively clean sound with low noise and interference levels is important. We suggest using a pickup microphone for electroacoustic guitar on ebay or Amazon.

The only thing that should be done with the clip is to remove the rubber pad because if it is not done, it works like a low pass filter and that would be counterproductive as it is necessary to eliminate the low frequencies and to maintain the highs, where is the greater information of the sound of the watch. The following link provides important information on this particular. See the link here. And download the pdf doc. http://www.iaeng.org/publication/WCE2007/WCE2007_pp624-629.pdf

THE PREAMPLIFIER

The tg software is designed to get the sound of a watch from overly specialized mics. However we have verified that using a pre-amplifier gives a signal of better quality. The microphone can be used directly in the microphone input of the computer but the signal will have a considerable amount of noise.

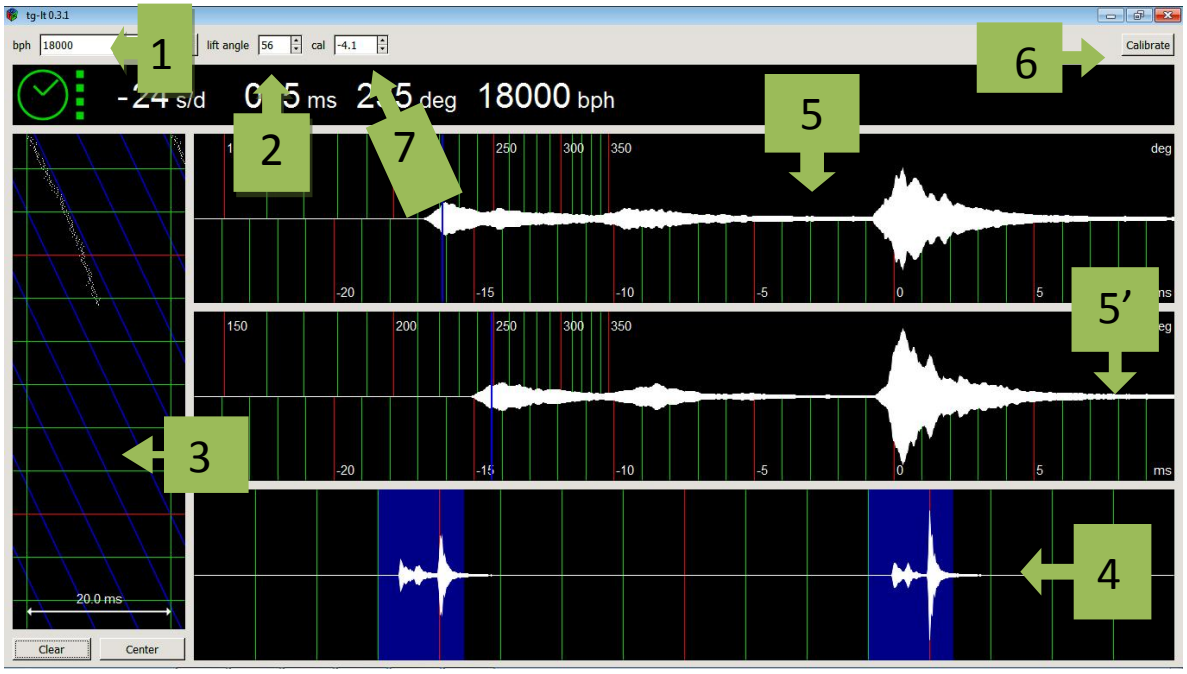
By integrating the pre-amplifier to the line, the result can be optimal. We have used with very satisfactory results the pre-amplifier the Mini Phono Preamp PYLE Model PP444. Here is a link on the modification made to the preamplifier. http://reparacionderelojes.weebly.com/modificacioacuten-de-pyle-pp440.html

However we have checked that the pre-amplifier works without any modification for the tg software.

ABOUT THE INSTALLATION.

You only need to download zip files from this link.
https://tg.ciovil.li/
If you are a user of Windows 7 or higher, use the link: "Microsoft Windows installer (7 and above)"
This will download the windows installer and will create in the programs two shortcuts Tg 0.4.0 and Tg lt 0.4.0. The tg-lt file seems to have less memory demand, but processor demand is kept high.

THE SCREEN AND THE FIELDS.



LIST OF EXPLANATION OF THE FIELDS

1.- BPH (Beat Per Hour) information window The program can automatically choose any value between 12000 and 72000 BPH. It can also be chosen manually. (Warning) From version 0.3.1, if you change it manually, this will be the next time the program is opened, you can leave it in "Guess", is automatic.

2. "Lift Angle" window. This value must be set by the user. Most watch movements have a value set by the manufacturer or movement designer. This value is used by the program to determine the Amplitude Balance Wheel. It will not affect the value of the gaining or losing rate, nor will the beat error value. But it will affect the Amplitude result. 52 degrees is an average value. Here a link with movements and their respective angle of elevation. See the link. http://longines30l.com/wordpress/?page_id=597

3. Window 3 is a "Paper Strip" emulator. It simulates a strip of paper, as in the old models of Timing machines, in which the successive points that indicated the clock record were printed. In the graph that we have of example we see that the succession of points is not vertical but has an inclination. To the left from the top. This indicates a visual losing.

4. In window 4 we see the presentation of the waveform for a complete cycle. I mean a tikc and a tock. Let's say "normal" A quick inspection of this window can help determine the quality of the Escapement performance.

5. In window 5 we find 5 and 5 '. They are two different windows dedicated to each one of the escape cycles. The wave form is elongated which allows a very precise detail of the escapement phenomenon that only lasts for milli-seconds.

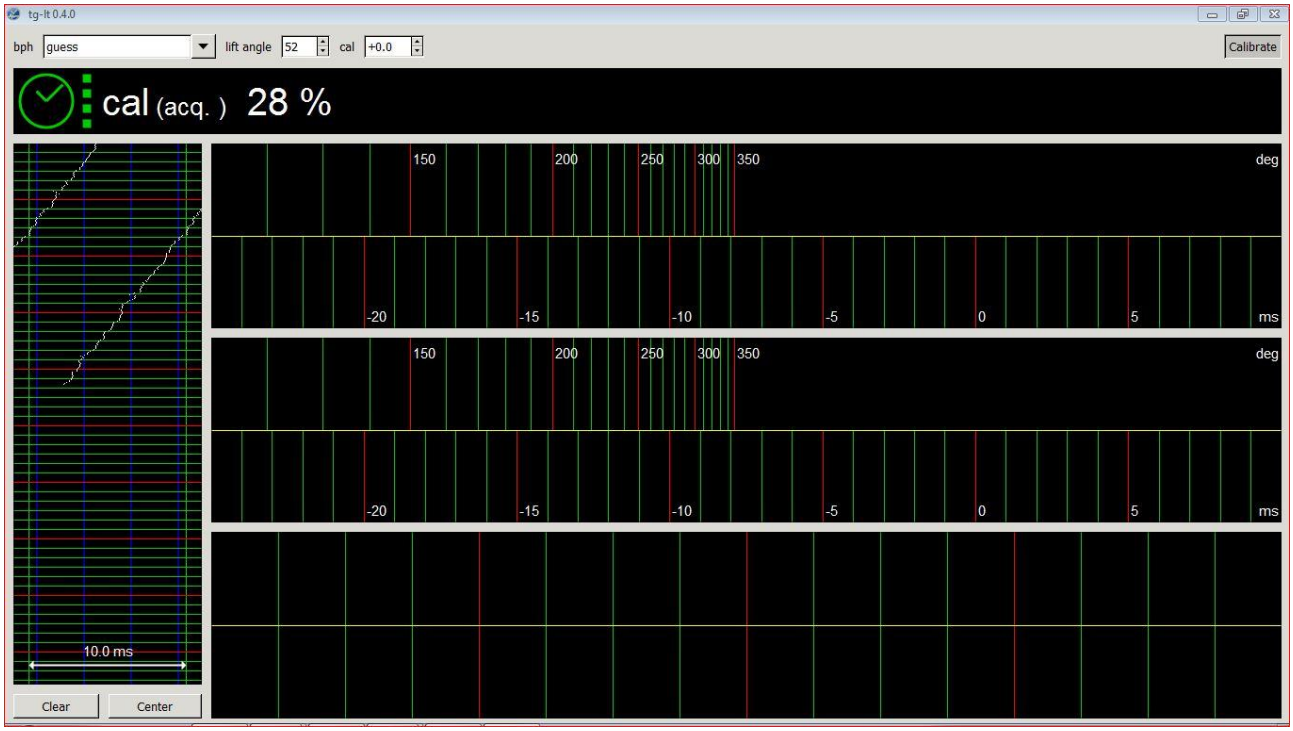
6. Calibrate button. This has to be done with the help of a very stable watch. Whose error rate we know and is less than 1 second per week. It can be a quartz watch of very good quality. The watch is placed in the microphone, and the calibration button is pressed for a time of about 15 minutes. The result against the known error value of our master clock will be the setting that will be entered in window No. 7.

7. Calibration correction value window. Although our computer has a very stable oscillator crystal, this is far from accurate enough to serve as a time pattern to a watch controller. Therefore it must be calibrated to determine the error of our "system". And make the respective correction.

CALIBRATION:

To calibrate the program, you need a clock with the accuracy rate less than 5 seconds per month.

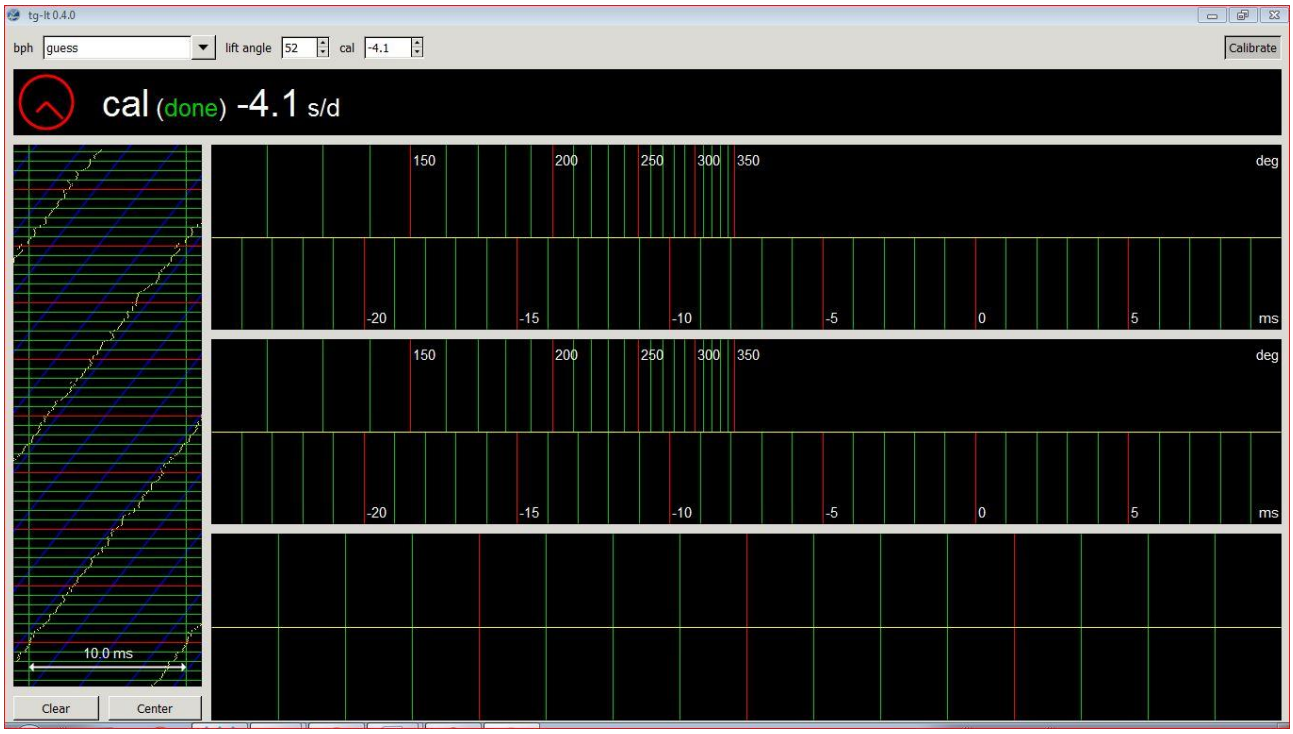
We use a 1 BPS or 3600 BPS step-by-step motor quartz watch. We put the watch in the microphone. Press the Calibration button and the program does its job.



Cal progress.

After about 15 minutes, the calibration will stop and give us the adjustment value that our computer must have. The program places the calibration value in the Cal box. The program is now ready for use with confidentiality. This of course assumes that the clock that was used for calibration is high accuracy. We suggest a quartz watch that has no "inhibition system".

Now press the calibration button again to exit Calibration mode.



The calibration is done.

HOW TO USE THE OSCILO-ESCAPE tg Timing Machine, or Timegrapher?

Before servicing a clock, the tg software can be used to determine faults and the watch status.
What to look for?

In the Paper Strip window, with approximately 80% of the winds, the gaining or losing rate of the watch will be analyzed. And you can determine the grade of beat error in the watch. If it were, the separation between the successions of points would be broad. They would appear as separate parallel lines. The more separated the more beat error there is.

In general, a quick pre-service inspection of a watch can help us detect faults that will not go away with the cleaning and lubrication service.

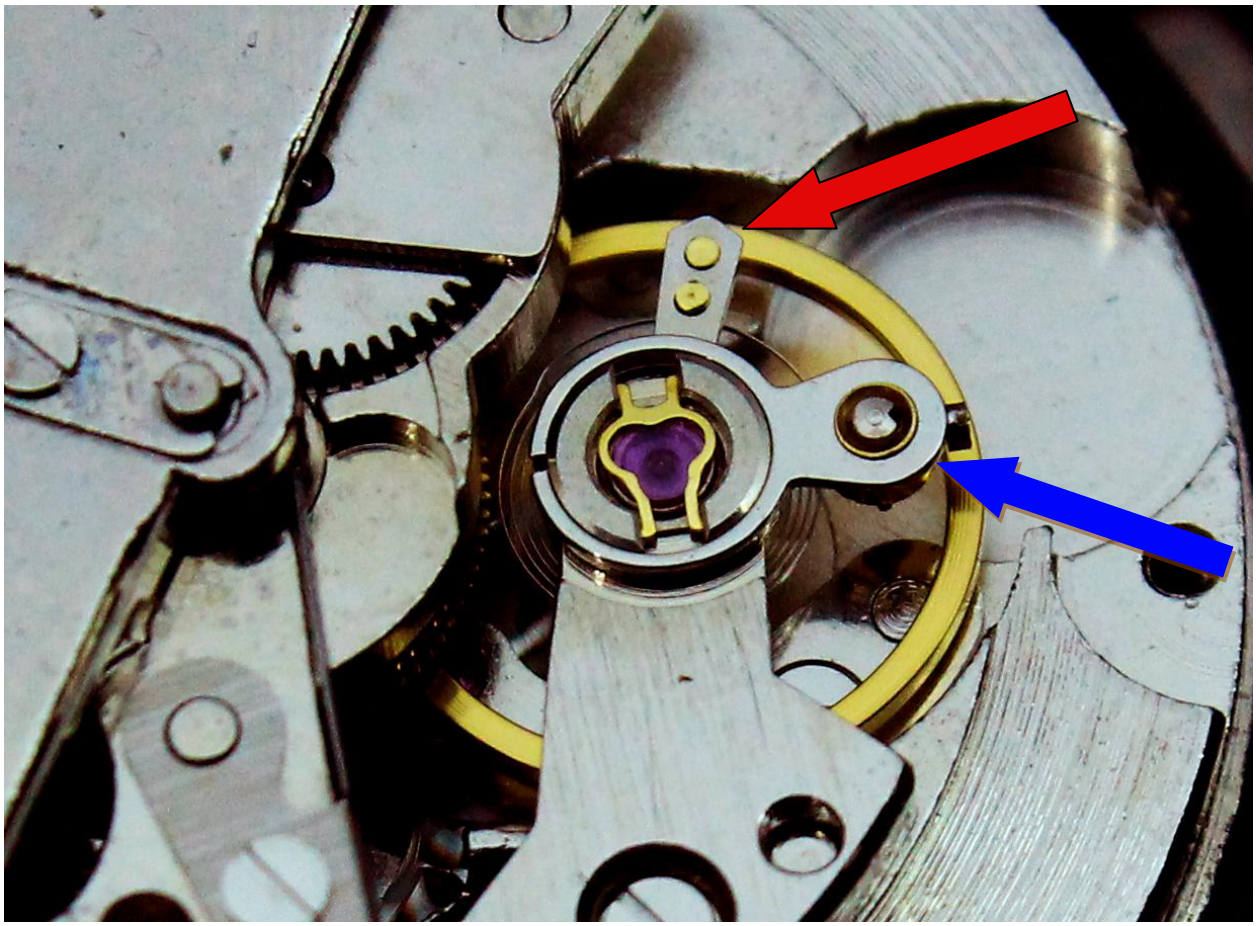
It is actually an inspection in search of bigger mistakes. The amplitude, the beat error and the rate will be modified in the cleaning and set-up service. And in view of the fact that when doing the service must move the devices that controls the beat error as the rate, that will be corrected in the final part of the service.

AFTER SERVICE.

FIRST CORRECTION: BEAT ERROR.

First, determine whether the Balance Wheel is in equilibrium. While the watch is being armed, it is visually inspected that the ellipse ruby roller jewel (impulse pin) is "centered" relative to the banking pins. If not, there are two possibilities. A) That the watch mechanism does not have a movable hairspring stud, which

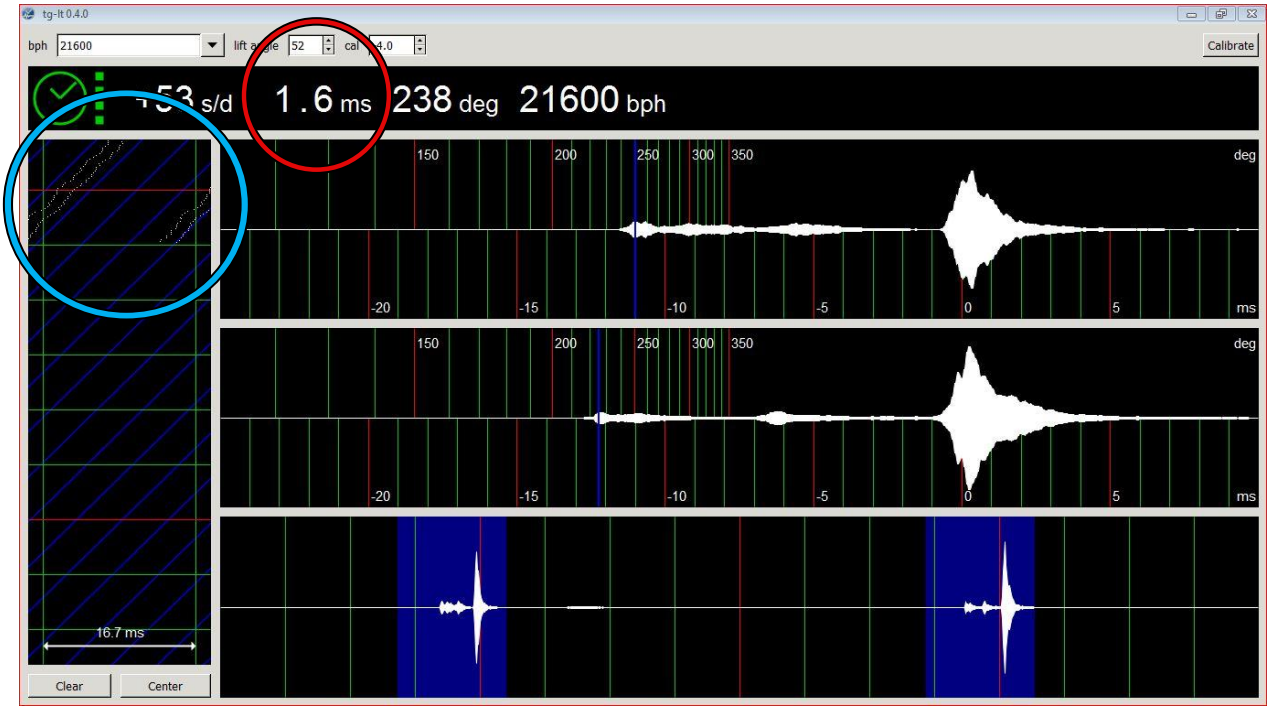
will lead to the "centering" by moving the *collet* on the balance staff. And B) if the hairspring stud is mobile, it moves to find the "centered" point.



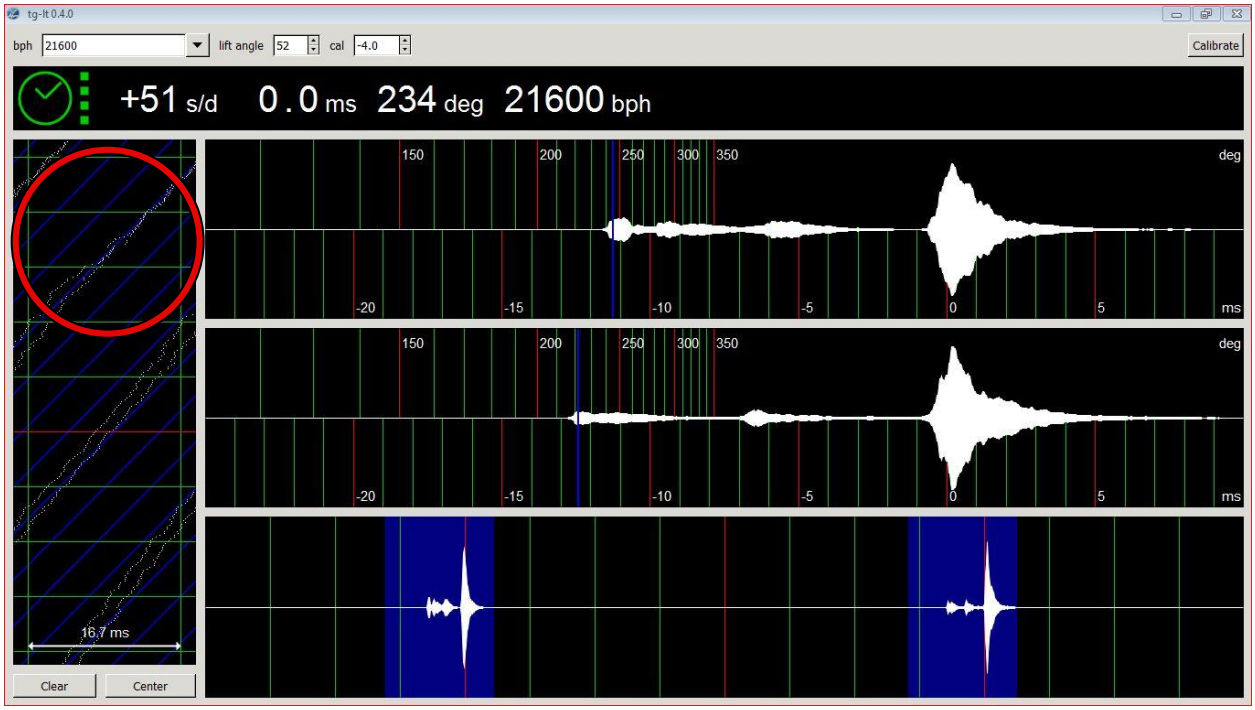
The Blue Arrow points to the **hairspring stud**. This moveable. With it we corrected beat error. The red arrow points to **the regulator**. With it we correct rate.

It should be noted that the manipulation of these two components is very sensitive. Not a few experienced watchmakers have slipped in making the correction by damaging the delicate mechanism of the balance wheel. For this reason do not practice with a Patek Philippe watch.

We test with my fake Rolex watch.



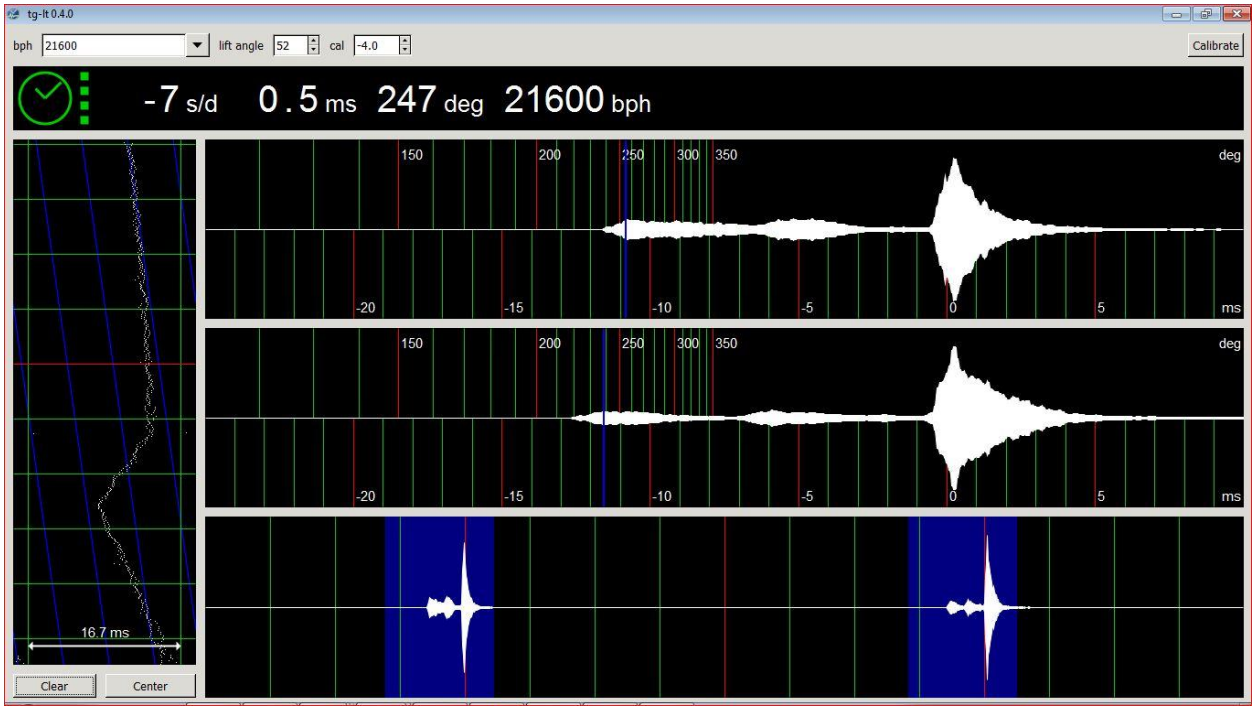
Here you can see a beat error of 1.6 ms. In the red circle. We see in the virtual paper strip (light blue circle), the parallel lines with a separation. We act first on hairspring stud.



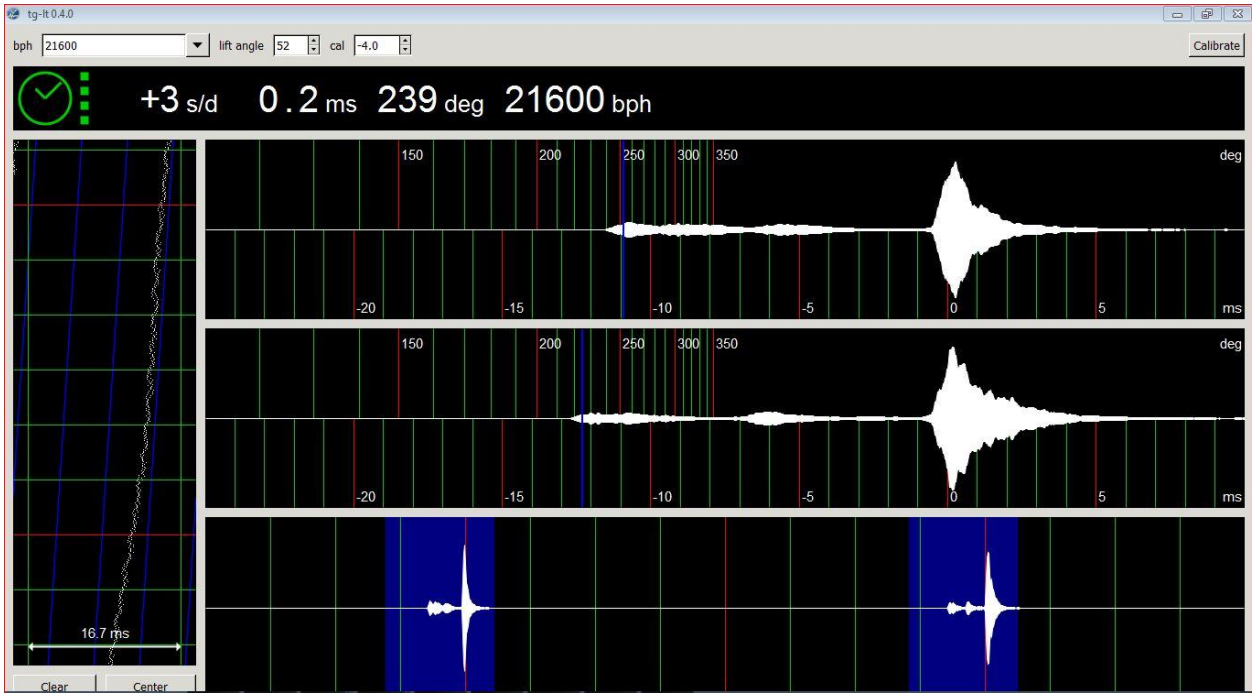
The red circle shows the "instant" of the setting. The beat error is corrected. The lines are no longer parallel.

Note that now is a single line. And numerically it is reflected in 0.0 ms beat error. We acted on hairspring stud.

Now we correct the regulator.



Note that the correction was made on the fly and that is reflected in the "paper strip". And again we must stress that the adjustment, particularly when less than 10 seconds a day to correct, requires great precision in the manipulation of the regulator.



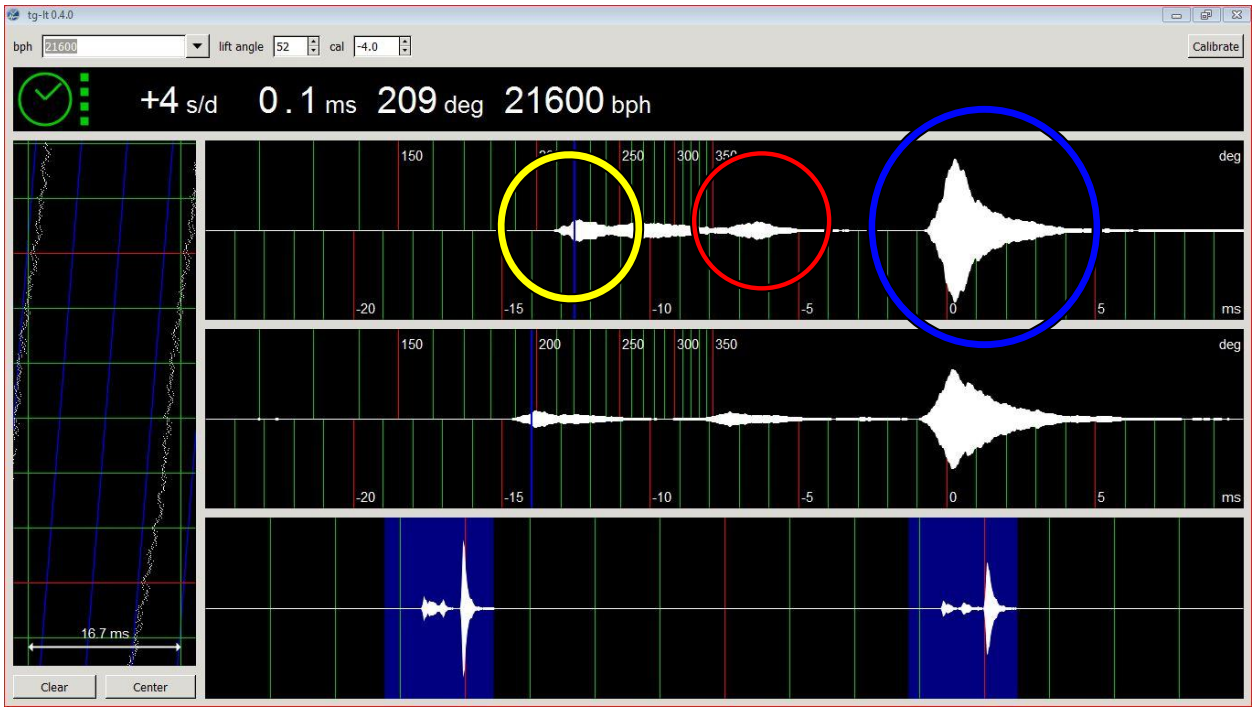
Patience of watchmaker. However experience indicates that the watch needs to be corrected in several positions. You cannot rely on a single watch position. Averages must be made in at least 4 positions. Dial up, Dial down, Crown up, Crown down.

WHAT ARE THE COMPONENTS OF THE WAVEFORM GRAPH?

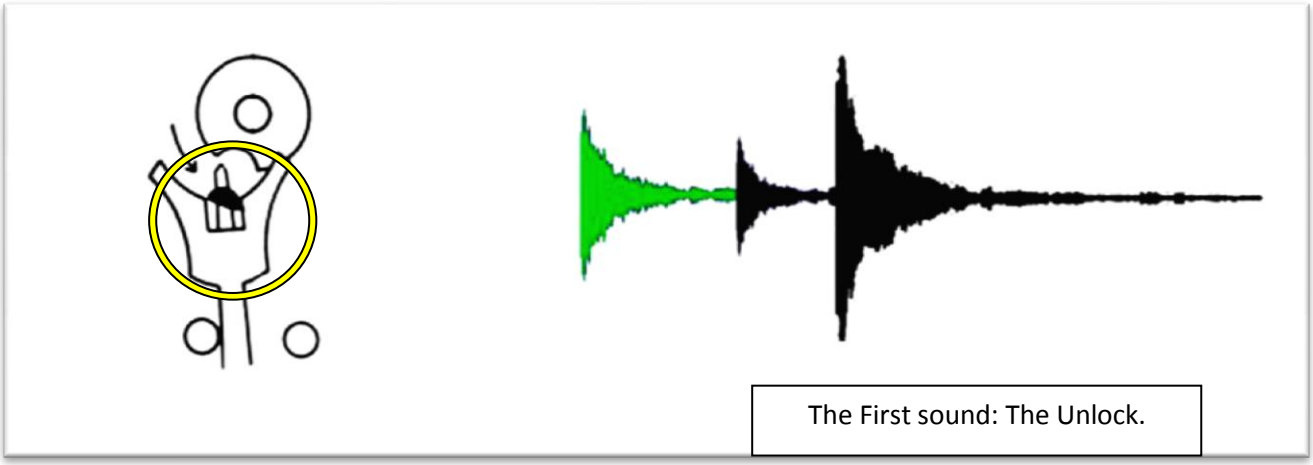
Each of the 2 cycles of the waveform can be divided into 3 components:

1. - Unlock. (Circle Yellow)
2. - Impulse, (Circle Red) and
3. - Lock or drop. (Circle Blue)

See it in circles. For simplicity we only use a waveform.

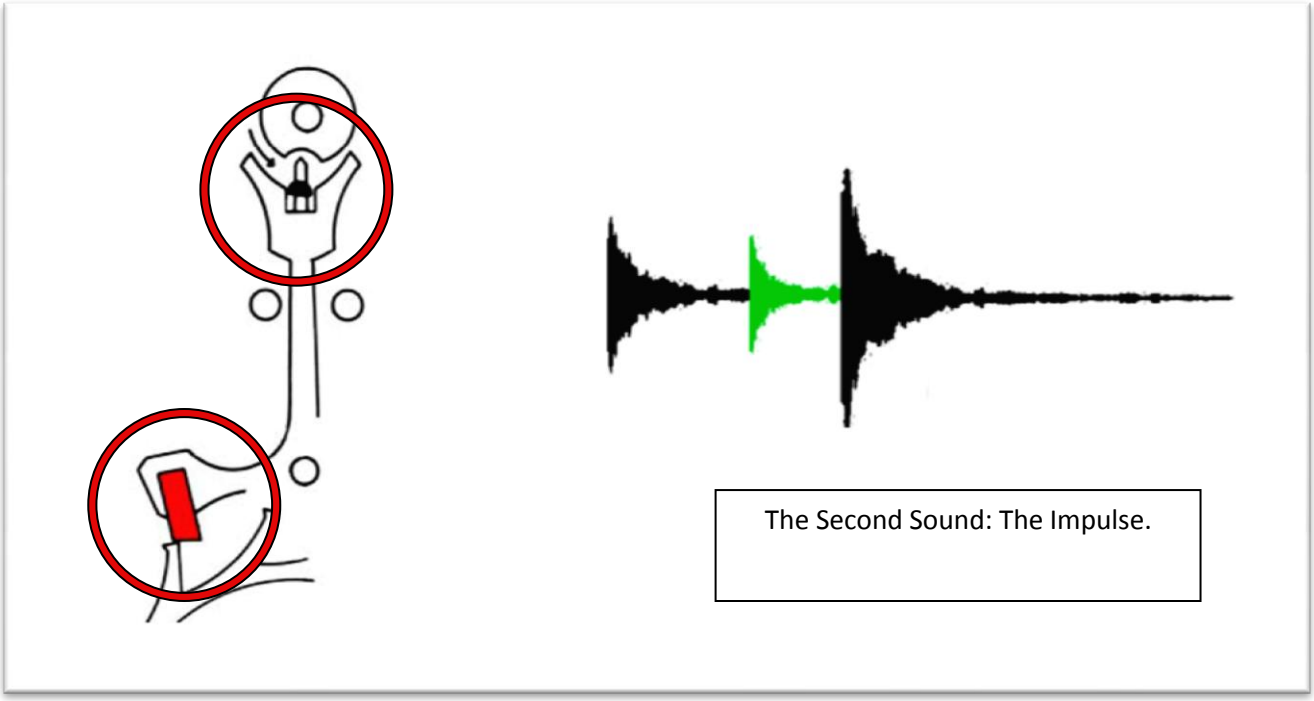


WHERE HAVE THEIR SOURCE THE THREE SOUND EVENTS OF THE WAVE FORM?



The contact of the ruby ellipse in the fork of the pallet lever generates the first sound indicated here in green.

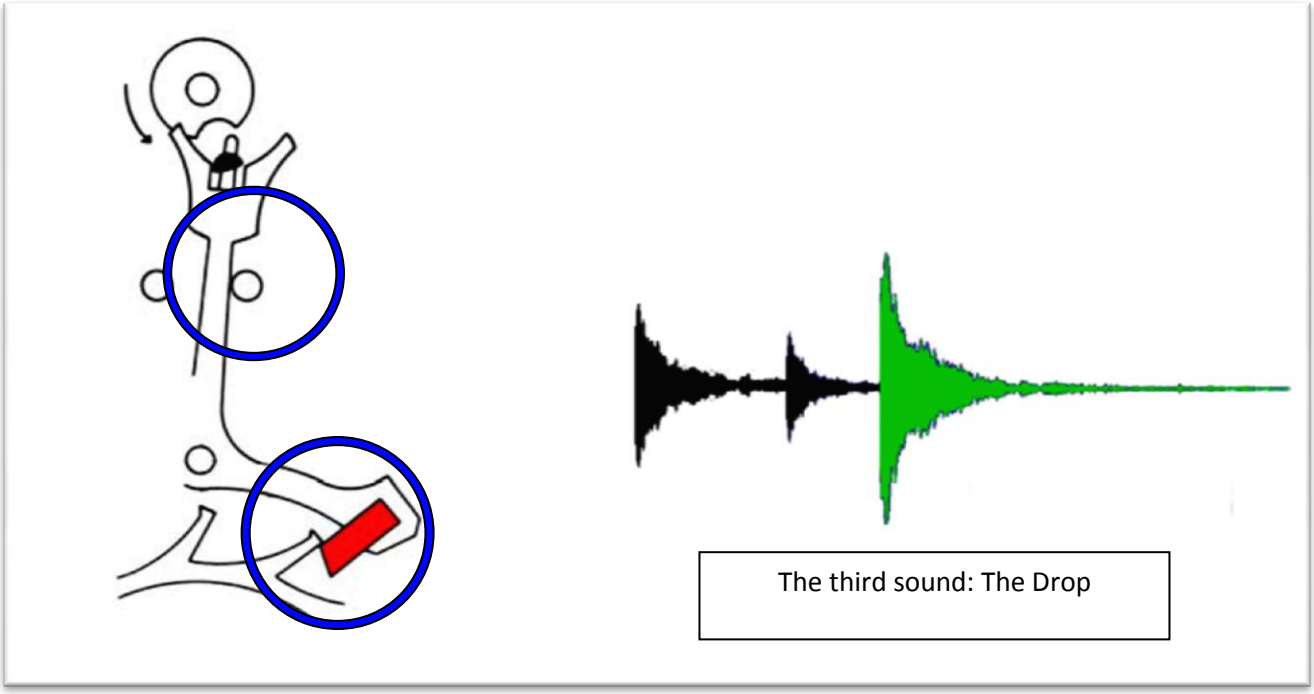
The second sound that may be the weakest, takes place in two parts: On the wheel tooth sliding along the inclined surface of the pallet, and some slight friction in the ruby ellipse and the pallets fork.



The Second Sound: The Impulse.

Here we see the two places where the event marked in green in the waveform takes place. It is the impulse.

The third event takes place on the locking face by stopping the movement of the escape wheel, "abruptly". That is why he is the strongest. That is why he is the strongest. However, it also occurs when the banking pin stops the path of the anchor lever.



The third sound: The Drop

Here the sound of "drop" or lock originates.

We must clarify that each watch differs from another in its characteristic waveform. The watchmaker must have experience in the control of the escapement mechanism and in that direction, the software tg Timing Machine will be of great help.

Good friends. Keep enjoying the wonderful tg program.

Guido Velasquez