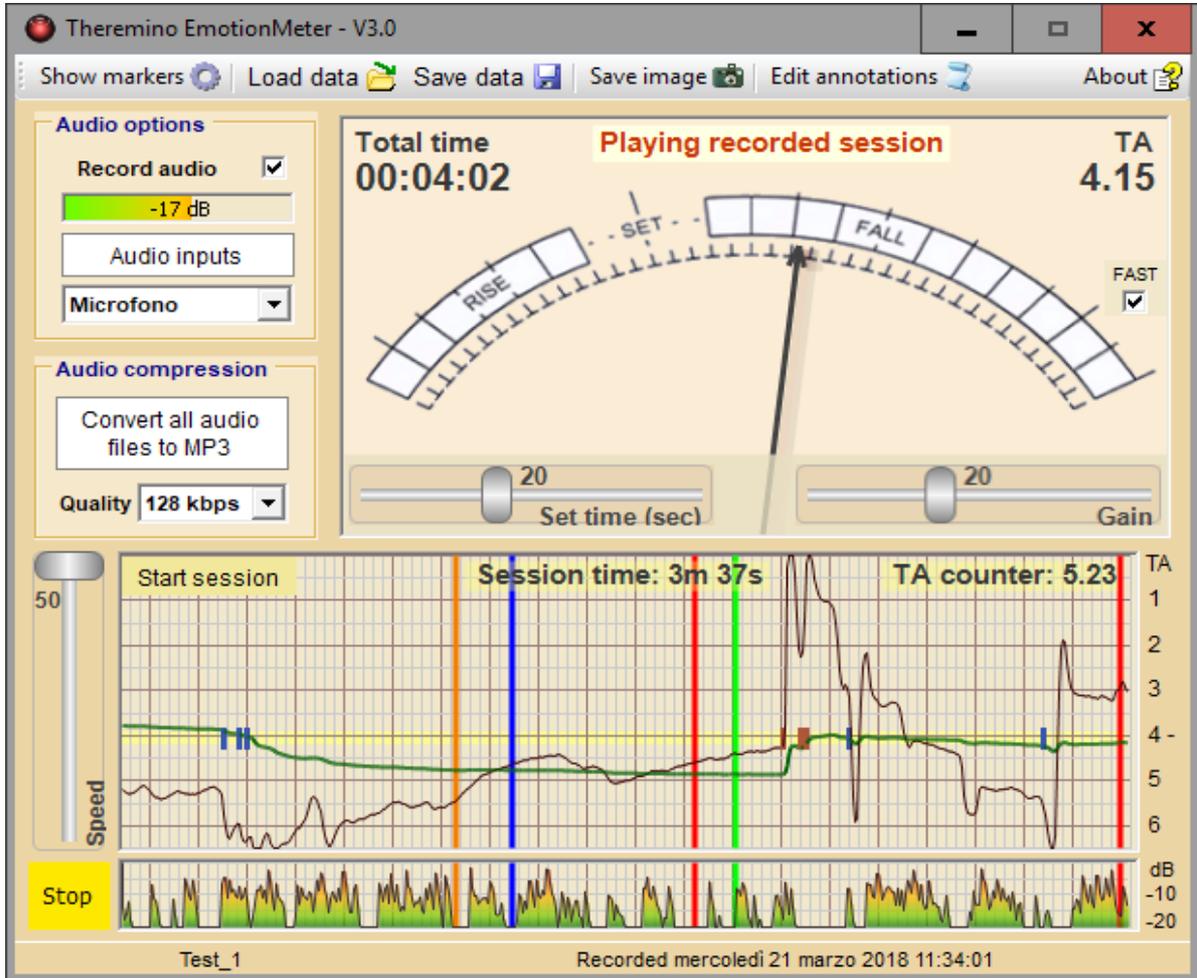


System Theremino



Emotion Meter application



Preliminary notes

The information, wiring diagrams, and images used by Theremino team are all in the public domain and freely available on the Internet.

The Ron Hubbard original E-meter patent ([US Patent n. 3290589](#), of the December 6 1966), has far exceeded the 20 years of validity, so the technologies specified by him may be used freely.

Moreover our implementation is totally different from the original E-Meter, which are unnecessarily complex, expensive and technically unreliable, as explained in [This Page](#) in Wikipedia and confirmed by many publications such as [Autopsy of an E-meter](#) or [This Page](#), or also [This](#).

Sometimes these pages disappear, if you cannot load them search it using WebArchive, such as this: [Autopsy of an E-meter](#).

On these issues they are at stake and powerful interests powers, even able to force the deletion of web pages.

Therefore we would like to clarify that our implementation is totally different from any similar device. The only common point is the measurement of skin resistance.

And also we point out that our Emotion-Meter application was written just for making experiments about detection of biological parameters, and only for scientific and technological research purposes.

The change of skin resistance induced by psychic stimuli is a confirmed validity [Observable](#), demonstrated by numerous scientific studies and used for decades in [Polygraphs](#).

The use made with these measures is beyond the scope of this work, and Theremino team assumes no responsibility.

In particular, our research does not give any credit to pseudo-scientific and potentially dangerous ideas, spread by religious [Multi-level](#) organizations and the many sites that deal with these topics.

Electrical connections

We recommend to use the instrument only with battery powered equipments. The computer used must therefore be a portable (notebooks, netbooks or Tablet), and the power cord must be disconnected from the mains, when the subject holds the electrodes in the hands.

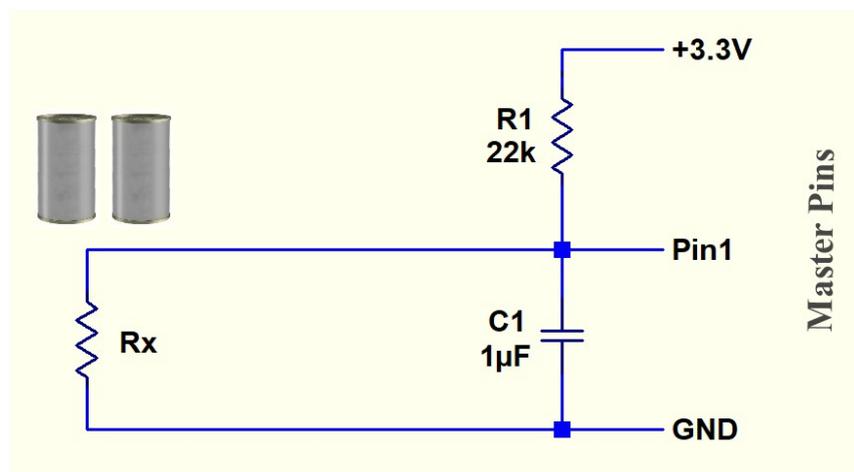
In fact normally there is no risk, even using mains powered devices. But this recommendation avoids the dangers in the event of computer power supply failures, of course independent from the Emotion-Meter application and our hardware.

Our software requires the use of one Theremino Master module and two cylindrical electrodes, which are connected to the Master module as per the following scheme.

For the first tests can be used electrodes of each type or even take the two wires between the fingers.

More information about the electrodes and the hardware components in the file:

[EmotionMeter_Hardware](#)

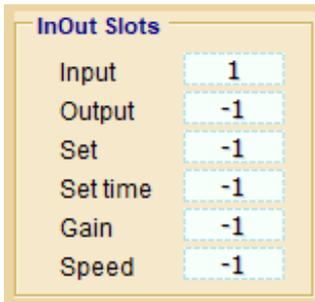


The accuracy of the resistance of 22k 5% value (red-red-orange-gold) is more than enough for the measures that need to be done with this unit.

The documentation related to the original E-Meter make great emphasis about setting operations, not because a particular precision is required, but only due to the 70s style construction, that tend often to go out of calibration.

So, even if not necessary, in the file EmotionMeter_Hardware (Page "Precision Calibration") can be found the explanations for accurate calibration of up to 0.1%.

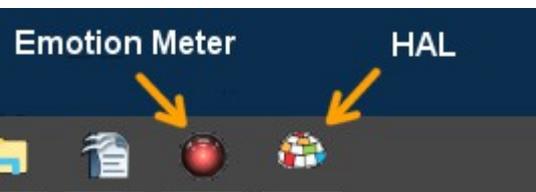
Software Settings



When you download [EmotionMeter](#) from the Theremino site, all settings should be right, but it's good to know how they adjust and how control them.

In Emotion-Meter application you must set the "Input slot" with "1".

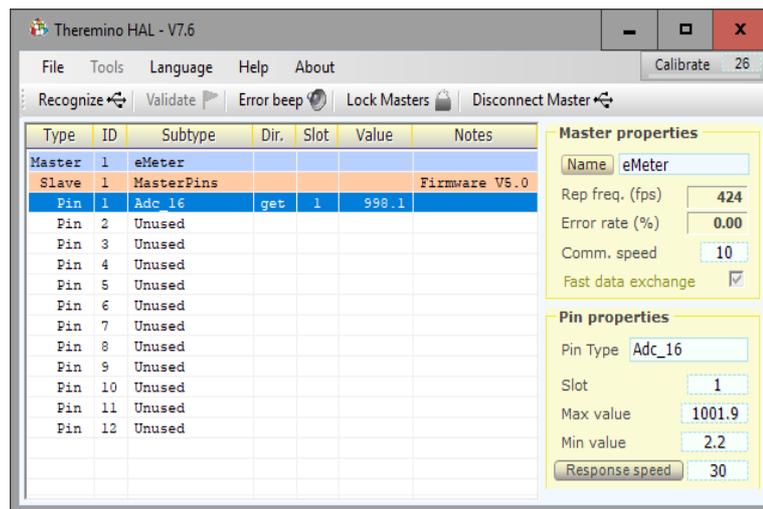
When you start "Emotion Meter", the "Theremino HAL" application also starts automatically, in order to communicate with the master module via the USB.



The HAL application should start minimized in the bottom bar (if it was minimized the last time you closed Emotion Meter).

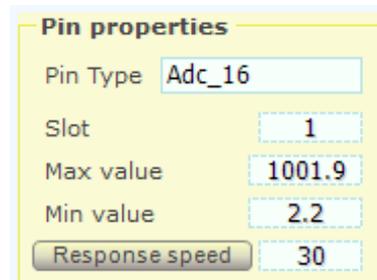
You must then click on HAL icon to open it.

Then you have to select the Pin of the first line (which should become dark blue).



Then check that the "Pin Properties" panel is set with "Adc16", "Slot1" and "response rate = 30".

The "response speed" button must be disabled, check that is yellow as seen in this image.



Finally, before closing Emotion Meter, remember to minimize the HAL, so the next time it will open in the bottom bar of Windows, and it will not take up space on the Desktop.

Device usage

The subject should grip the electrodes in a relaxed manner, completely enveloped by keeping them with their hands, but do not tighten.

Any rings, or other metal objects, must be removed, because they create false readings, flicking the needle.



In the first minutes, it is possible that the needle moves out from the set area. It is the time for adaptation between the subject and electrodes, wait until the needle stabilize in the SET position.

When the zero is stable, ask the subject to tighten the electrodes. It must not strive, simply tighten.

You have to adjust the GAIN control so that when the subject squeezes the electrodes, the needle goes to the right, for a portion of about half of the section between SET and the right side scale end.

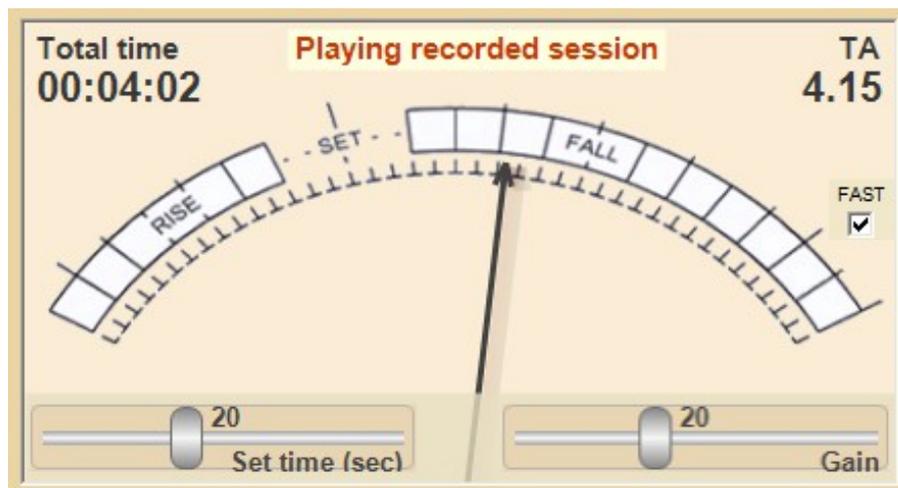
When the subject ceases to tighten the electrodes, the needle has to go in the RISE field, and then return to SET.

If necessary, ask the subject to release and tighten several times, repeatedly pressing SET and changing the GAIN again.

Start with a GAIN of 10, and modify it as needed.

Important note: while using of the tools, the subject must not see the dial, because it could influence the results.

The needle dial



At the top left shown the total time measured from the beginning of the session. At the top right shown the TA value, equivalent to the "Tone Arm" knob position of the original instruments, which traditionally had a calibrated scale from "0" to "6.5".

A value of TA equal to "2" or lower indicates a very low resistance that we did not obtain in our tests, unless by wet the hands with water and salt.

The normal values, from "3" to "6" represents resistance ranging from approximately 10 kohm to approximately 200 kohm.

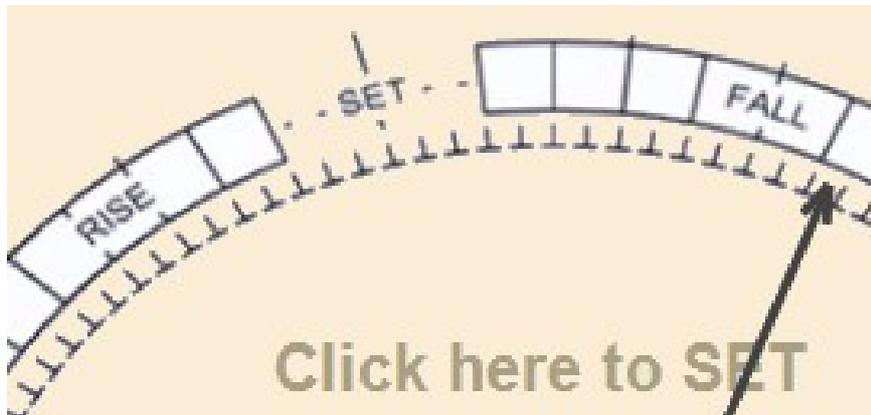
Whit no subject connected to the electrodes, the TA value increases almost up to the value "6.5", without ever reaching it, because would amount to an infinite resistance, which is impossible to achieve in the real world.

Whit subject connected, the TA value shows what could be termed as its 'basal resistance'. From this moment onwards, any variation will produce a needle's movement, in the RISE direction if the resistance increases, and in the FALL direction if the resistance decreases.

On the right side you can see the "FAST" control that, when enabled, increases the inertia of the needle indicator. With "FAST" enabled, the needle can swing as the original instrument and, in some cases, take speed and slam at full scale.

By setting the two sliders in the bottom you can adjust the movement of the needle as will be explained in the following pages.

The RISE, FALL and SET indications



The RISE and FALL indications are inverted, compared to what you would expect. When the needle goes to the right, one would expect an increase (RISE), but the right scale zone say FALL.

This is due to the fact that RISE and FALL refer to changes of resistance and not of emotionality.

An increase in emotionality causes an increase in sweating, and thus a lower electrical resistance (FALL). And vice versa a lower emotionality causes a higher electrical resistance (RISE).

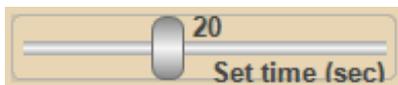
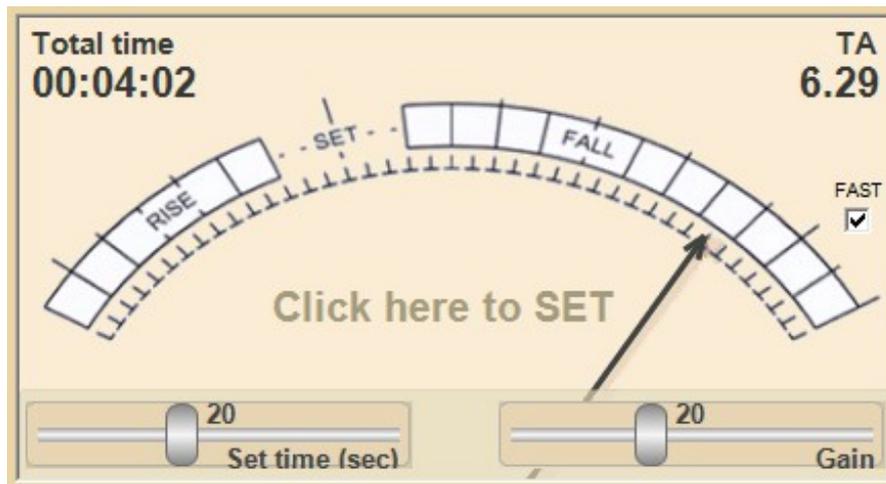
In the original instrument, it was necessary to manually balance the measuring circuit, continuously turning the TA (ARM Tone knob) with the thumb of the left hand, in order to maintain the needle in the SET area.

In our unit just click on the scale and the necessary adjustment is calculated by the software and set instantly.



Also, if you adjust the "Set cursor time (sec) = 20" as recommended by us, the adjustment is so constant and continuous. So the needle, in the absence of useful readings, always tends to return to the SET position.

The "Set Time" and "Gain" sliders



The "Set time (sec)" slider adjusts the reset time and mode (SET) and will be explained in detail on the next page.

The recommended value by us is about 20 and can be easily set by clicking with the right mouse button.



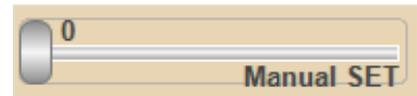
The "Gain" slider adjusts the sensitivity of the movement of the needle, relating to the resistance modifications.

If you set a low value, the needle will move little and will lose the details of the most slight variations. If you set an high value, the needle will remain long towards the scale limits and even in this case you will lose some variations.

The recommended value by us is about 20 and can be easily set by clicking with the right mouse button.

The three operating modes

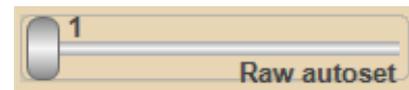
Manual operation



It is possible to obtain an operational mode identical to the original equipment by setting this slider to "0".

We eliminated the need to constantly turn the knob "tone arm" with the thumb to keep the needle to SET, and we have made this operation easy and immediate. Simply click on the instrument dial (or touch it if you use a Tablet).

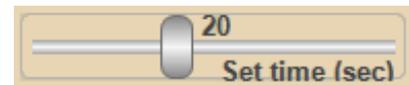
Automatic raw operation



By adjusting the cursor with "1" is obtained the operation adopted by some commercial appliances, such as [Theta-Meter](#) eg.

This is a crude and mechanistic operation. The needle is moved instantly on the SET position, all times that it exceeds the full scale. But often this does not happen when you want, but just the wrong moment, without regard to the questions you are doing and what is happening on an emotional level. You can see this snap-in operation in [this video](#) (at time 13:41, 13:48 and 13:50 and from 14:59 to 15:03).

Operation with adjustable derive



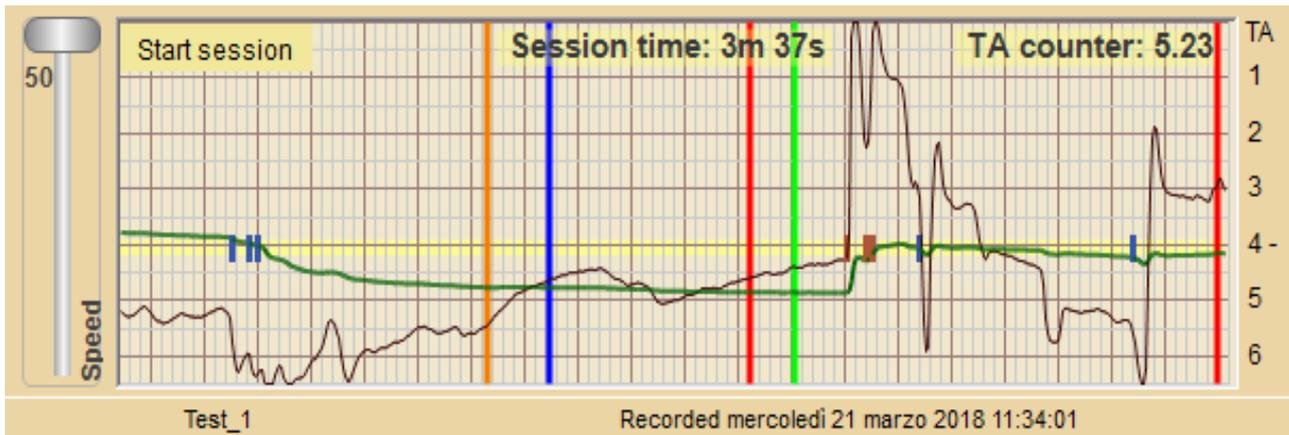
By adjusting the cursor to "2" and higher, the needle is constantly automatically moved to the SET point. The time in which this occurs is adjustable in seconds.

With this method you should never intervene. You can use the device even alone. Or you can ask questions via Skype and record the session, and then revise it and evaluate it together later.

This method also contains a "self-range" that when the needle go out the scale ends, remove the delay needed to return to the dial working zone.

And finally, if you want, you can always do a manual SET, by clicking on the scale of the instrument (or touch it if you use a tablet).

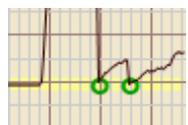
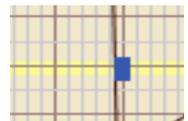
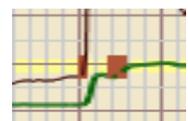
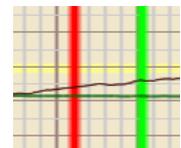
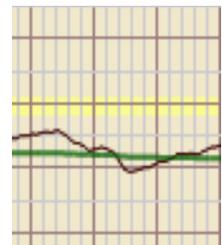
The chart recorder scale



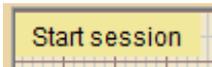
In the lower zone there is a chart recorder (the paper is simulated by the sliding on the video).

This display is a peculiarity of Theremino Emotion-Meter, and is not present in the original instruments.

- ◆ "Session time" is the time relative to the particulars that are seen on the extreme right of the graph.
- ◆ "TA counter" is the sum of all changes in TA that cause movements of the hand to the right.
- ◆ The green line represents the value of TA.
- ◆ The dark, thin line represents the movements of the needle. The scale is the same of the needle dial, with RISE downward, FALL upward and the SET line, highlighted in yellow, located not in the center of scale.
- ◆ The long blue, orange, red and green vertical stripes are markers, that you can manually set to mark points of particular interest.
- ◆ The small red markers, which are located in the central area highlighted in yellow, indicating the points where the needle touched the end of scale, on the right.
- ◆ The small blue markers, which are located in the central area highlighted in yellow, indicating the points where the needle touched the end of scale, on the left.
- ◆ The small green circles indicate a manual SET operation.



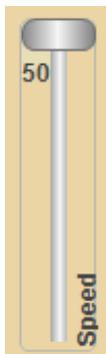
Recording a session



You start recording a new session by clicking on "Start session".



The button turns orange, text changes to "Stop" and the paper starts to flow



The "Speed" slider changes the paper feed speed.

With Speed at maximum (50) you can appreciate the most rapid details, down to fractions of a second.

With speed to a minimum (1) can be seen simultaneously up to thirty minutes of the session.



Clicking the "Stop" you stop the recording.

After stopping the session, you can save it to disk, and then review it in detail, and even scroll it back and forth.

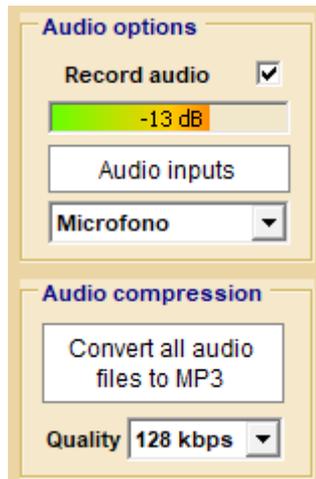
To scroll the session using the left mouse button, holding it down and moving the mouse left and right.

You can also use the mouse wheel, or a finger if you have a touch screen.

Audio recording

To record the audio of the session opens the panel "Audio options" and enable "Audio Record."

If the panel "Audio options" is not visible, repeatedly press the first button on the left toolbar, until it appears. The toolbar is explained on the next page.



The colored gauge helps to adjust the volume.

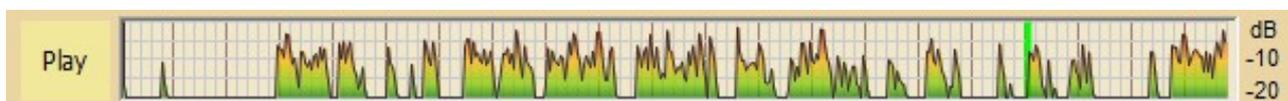
With the button "Audio inputs" opens the panel of "Recording Devices" to adjust their properties, mainly the preamplifier and control of the volume of the recording.

By clicking the control that in this image indicates "Microphone", you can select the source to record audio. This choice must be made before starting the recording session.

After recording several sessions, especially if they are very long, the occupied disk space can be several Giga Byte.

If you want, you can press the button "Convert all audio files to MP3" and reduces the disk occupancy to less than one tenth (with quality 128 kbps) or even up to a hundredth with lower quality. It is not advisable to go down a lot of quality, because even with the best quality you can record thousands of sessions, although they have a hard drive smaller.

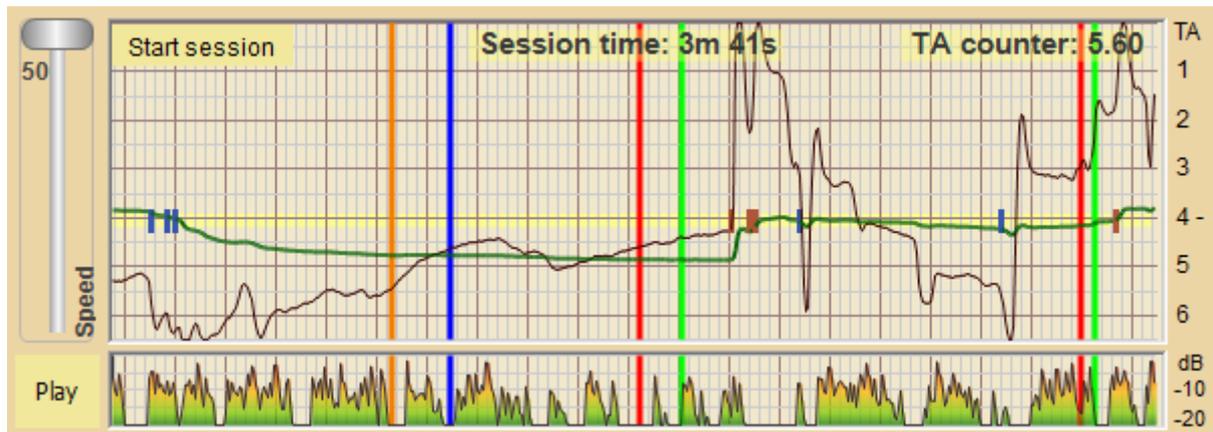
The audio track



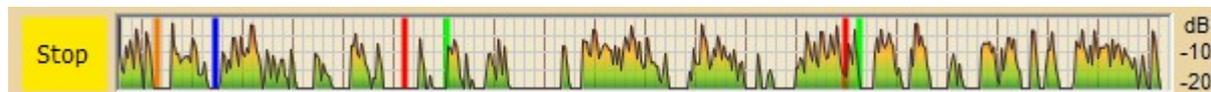
The audio track is displayed both during the recording session and during listening, showing the sound level.

While listening you can visually identify the points where they begin sentences and moving the track with your mouse, listen to the chosen points.

To play back a recorded session



The "Play" button starts the play back, and pressing it again it stops.



To listen again, starting from an arbitrary point, dragging the traces left and right, with the left mouse button, or your finger, or with the mouse wheel. You can do this even while listening. It is not necessary to press "Stop" and restart it with "Play".

To make long movements (tens of minutes) it is good to compress the scale before, lowering the "Speed" slider.

Another way to change the position is to use the mouse wheel, which (if rotated rapidly) can make big moves with every rotation. Turning quickly, has a greater effect, turning it slowly is more accurate.

The point of the recording that you listen is to the right, where the lines appear.

The right point is also the center point of the zoom when you zoom in and out the visible area with the "Speed" slider.

The toolbar

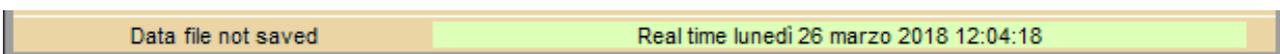


- ◆ **Show audio options** - You can use this button to choose the options panels. The button changes to "Show inputs", "Audio Show options", "markers Show" and "Hide all controls", depending on the currently displayed panel.
- ◆ **Load data** - Use this button to select and load the sessions stored on disk for playing back and listen again.
- ◆ **Save data** - Use this button to store the sessions to the disk assigning a name to it.
- ◆ **Save image** - With this button you can take a snapshot of the application and store it on the disk.
- ◆ **Edit annotations** - This button opens the annotation file with the default editor in the system. The annotations file is in RTF format so it should be opened with "WordPad", which also allows you to change the font size and color, and add images, graphics, Excel charts, and other objects.
- ◆ **About** - This button opens the information window of Emotion Meter application.

The status bar



This bar shows the name of the session that has been archived to disk, and the date and time of the end of the session.

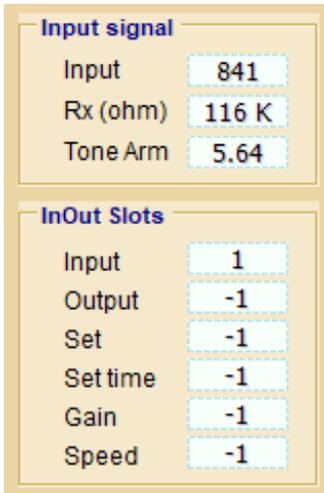


When recording a session, the left side changes to "Data files not saved" and the right side shows the present moment, shown in green.

The option panels



Pressing the first button on the top bar you choose the option panels.



The "Input signal" Panel

Input - Measured value normalized from 0 to 1000

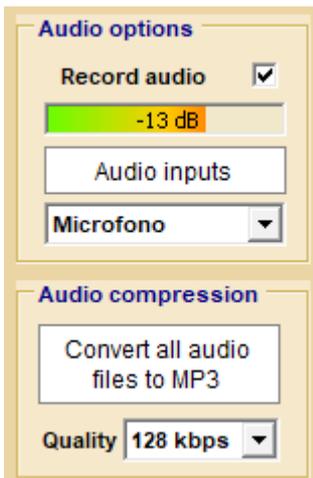
Rx (ohms) - Measured resistance in ohms or kohms

Tone Arm - Calculated value of TA, from "0" to "6.5"

Input - Set the slot from which to read the signal.

Output - Set the slot to send the needle's position.

Set, Set Time, Gain and Speed - They are the slot to make the SET and adjust the parameters from the outside. For example, with a pedal or with [voice commands](#) (the value "-1" will disable them).



The "Audio Options" panel

Audio Record - Enable audio recording

Colored indicator - Show the record level

Audio inputs - Opens the "Recording Devices"

Microphone - Choice of audio input device

Convert audio files to MP3 - Significantly reduces the space occupied by the audio files in the hard disk.

Quality - Quality of the compressed MP3 files



The "Markers" panel

Red, Orange, Green and Blue markers - You can press these buttons at any time, both during the recording session, and later when you manually scroll or listening the recorded audio.

Markers are colored vertical lines that serve to highlight and find points of particular interest.

With "Delete marker" deletes the marker positioned at the far right of the chart and "Delete all markers" you delete all of them.

Using buttons and knobs

By adding a button and a few potentiometer (a few euros in total) you can control all functions with knobs, exactly as in the original equipment.

InOut Slots	
Input	1
Output	-1
Set	-1
Set time	-1
Gain	-1
Speed	-1

First, set the features to control, with a slot other than -1 and all slots different from each other (as seen in the image at right).

InOut Slots	
Input	1
Output	2
Set	3
Set time	4
Gain	5
Speed	6

Output

Used to connect a servo with a needle which repeats the movement of the needle on the screen (something like [this video](#)).

Set the Pin 2, on the HAL, with Slot 2 and as "Servo_16".

Connect the Servo to the Pin 2 of the master module.

Set

Used to make the reset (SET), with an external button.

Set the Pin 3 with Slot 3 and as "DigIn_pu" on HAL application.

Connect to the button to SIGNAL and GND of Pin 3 of the Master Module.

Set time, Gain and Speed

Used to move the three sliders with external potentiometers.

Set Pins 4, 5, 6 with Slots 4, 5, 6 and "Adc16", on the HAL app.

Connect one end of all three potentiometers to GND on the Master.

Connect the potentiometer central wire to Master Signal Pins 4, 5 and 6 .

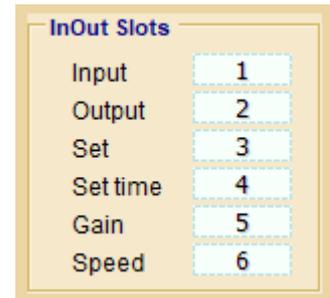
Connect the other end of all three potentiometers to 3.3 volts, on the Master.

Tips:

- ◆ The button will work inverted, so you use a button with normally closed contacts or you exchange the MinValue and MaxValue values on HAL (ie are set MaxValue = 0 and MinValue = 1000).
- ◆ Not all controls must be mandatory connected. You could use only the SET button or just the SET button and Gain potentiometer.
- ◆ Remember to set all unused Slots with "-1".

Manage options with your voice

First, setting the features to control, with a slot other than -1 and with different slots between them (as seen in the image at right).

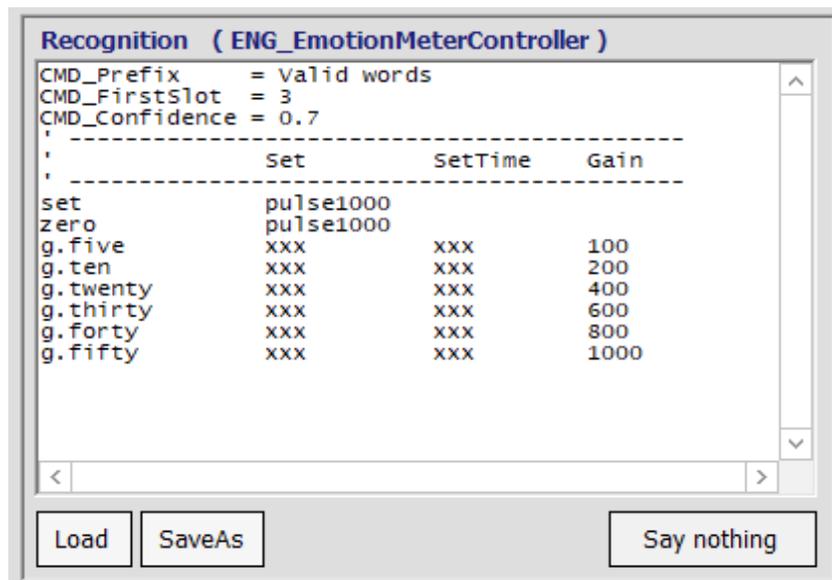


No need to use all the functions, you may want to just start with "Set" and "Gain" and leave all the other slot to "-1".

Then download the application [Theremino Voice](#), Install the voices in your language and learn to use the application.

As written, it is recommended to use only "Set" and "Gain", either because they are the only controls that are modified during the session, and because fewer words there are to recognize and more recognition will be accurate (it is also important to know that to improve the recognition you have to speak close to the microphone).

We can see in this image how to configure the recognition in the Voice application.



It is assumed here that "Set" is on slot 3, and "Gain" on Slot 5.

Before to write this text, press the "SaveAs" button and save with a name such as, for example, "ITA_EmotionMeterController".

(You do before you start writing because the "Voice" app. uses and modifies pre-loaded files).

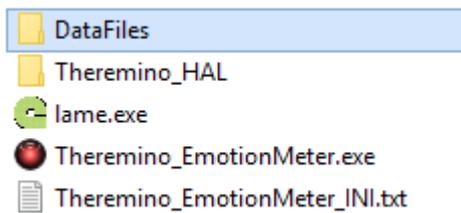
Writing these lines by hand is not difficult, but we have also prepared a file to download (not just to encourage laziness, but also to avoid errors).

Download the compressed file from [this link](#), then extract the two files (Italian and English) in the Theremino Voice "Recog_Files" folder. Finally, choose the file in your own language, using the "Load" button, located at the bottom left below the "Recognition" box (if you download the last Voice app. V1.9, those files are already in the "Recog_Files" folder).

Delete or move files

After using the device for a long time you might want to delete some recordings to preserve disk space.

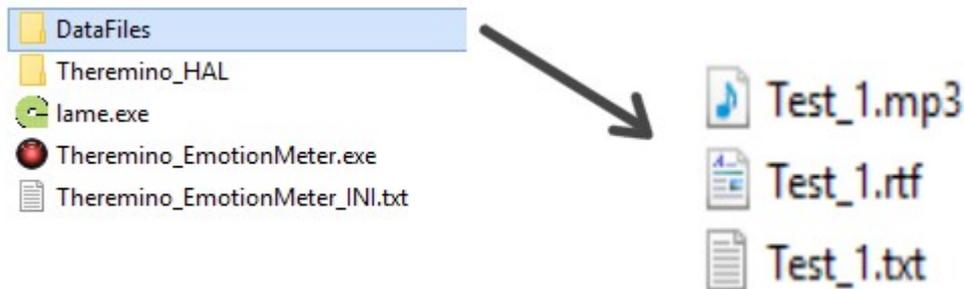
Eliminating the sessions that you no longer want reduces their number and thus makes it easier to spot the ones that you want to open. It could also be a good idea to create multiple folders and move them in some sessions, dividing them by subject or by other criteria.



To do it open the folder "Data files" which is next to the main file:
"Theremino_EmotionMeter.exe".

Then use the standard Windows tools to delete files or create new folders and move files.

It must, however, pay attention because each session can be composed of a minimum of a one file, up to three files, all with the same name but with different extensions.



For example, if the session is called "Test_1" then its main file is "Test_1.txt" and ancillary files (which do not always exist) will be "Test1_rtf" and "Test1_wav" (or "Test1_mp3").

If Windows folders are not showing extensions (txt, rtf, wav and mp3), you have to open the "View" menu, "Options" and "Display" and then disable "Hide extensions for file types known. "

When you delete or move files, you must delete or move all (one, two or three may be).

How to hold the cans

The electrodes must be held relaxed, wrapping the hands loosely, unless the operator does not require it to calibrate the instrument.

They must be held as the motorcycle's knobs, but keeping them vertical. It is very important to remove rings and other metal objects, because they can create improper needle movements.

Sit quietly, you can also rest your arms on the legs to avoid fatigue, or you can rest your wrists on the edge of the table.



Before the meter is working properly, you need to wait some time. When use the original instrument, people said that the cans must warm up. In fact, in this time the sweat creates a large number of electrolyte paths between skin and metal. A dry skin, no sweat is almost completely insulated, so in some cases this time may be quite long, even a few minutes.

During the first session, use this time to explain to the subject how the tool works.

If necessary, reassure the subject that there is no risk of electrical shock, and that there is no danger. The current passing through the body to perform the measurement is weak, absolutely imperceptible, and can not create any damage.

Some authors write that the eMeter electric current can generate addiction by reducing the pain, with the same mechanism used by TENS devices, see [This Page](#).

Who writes this does not have sufficient electronic knowledge to realize that the current generated by the eMeter is significantly lower.

The current generated by eMeter is very weak and can not generate biological effects, much less a reduction of pain or addiction phenomena.

Using Emotion-Meter alone

The use of this instrument by themselves, grasping the electrodes and watching the needle behavior, can be framed in the sphere of bio-feedback, or personal knowledge of their biological processes.

The bio-feedback is a technique used in the treatment of certain diseases, what you tend to get is usually a relaxation.

It can be interesting to evaluate the operation of the instrument on themselves, to understand the adjustments, and to see the needle behavior, but it is important to take into consideration that this observation leads however to phenomena of adaptation and self-regulation.

From the technical point of view, the program can be adapted for use by themselves, thanks to the Slots that allow you to control SET and GAIN from the outside.

These slots may be associated with inputs of [Master module](#), and controlled for example with pedals, to allow you to hold the electrodes. But you can also use voice commands, through the [Theremino Voice](#) application.

Or you could build an electrode for use with a single hand, thus having the other hand available for the adjustments.

Envelop a few turn of insulating tape for electricians on the bottom of one of the cans, and then coupled it with the bottom of the other one, and connected both each other using the insulating tape again. Or interposes a plastic disc and paste to the two cans of funds with plenty of hot glue. In this way, the two cans are electrically insulated from each other, but mechanically joined.



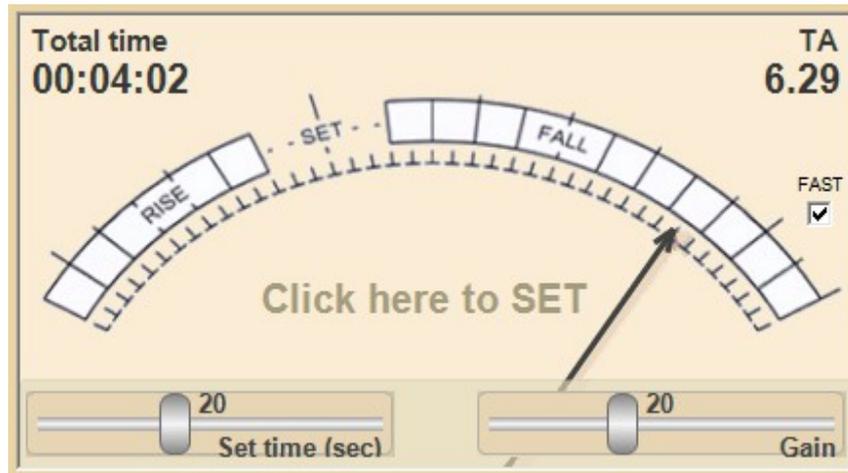
This electrode can be easily holding with one hand, placing the isolated junction in the center of the palm of the hand.

To compensate the reduction of the contact surface, increases the "Gain" cursor approximately double.

The needle movements

As already mentioned, the needle indicates the variation of resistance of the subject connected to the electrodes.

This reading is subject to variations in size and speed, and the purpose of this tool is to precisely display and highlight these variations.



According to traditional theory of these devices, a human subject, stimulated verbally, visually or acoustically (with questions, images or sounds), would present resistance variations with distinctive features related to the emotions aroused in the subject.

The needle moving to the right would identify the pleasant emotions, while the displacements to the left would be associated with unpleasant emotions.

The choice of scale with the zero shifted to the left shows the intention to investigate in more detail the pleasant emotions than unpleasant.

Every person is different, and therefore not all people produce the same readings on the instrument.

The majority of people should react with similar variations, where the stimulus corresponds to a certain movement of the needle, but the literature on the instrument describes several typical cases.

For example, one of these cases is the blocked needle, ie those people who, even if stimulated, do not exhibit appreciable changes in resistance.

On the web there is a lot of literature on needle movements, you could for example start [This Page](#). But keep in mind that much of what we read has no scientific or medical basis.

The operator to subject relationship

The needle movements may disclose information relating to the conscious and unconscious, personal sphere of the subject.

Under this aspect, the way in which the unit actually works is completely irrelevant.

Operator and subject, both rely on the instrument and consider the readings as reliable. This makes credible the information and creates a relationship between the two persons.



You can then create psychological bonds similar to those of the psychotherapeutic treatment.

It is recommended to take into account these possible interactions.

How solicitate the subject

In the literature associated with the original instrument there is the "pinch test", performed as a first experiment to demonstrate to the subject that the instrument responds to his emotions.

The operator shows to the subject the instrument display, gives a pinch and immediately the needle should move.



Subsequently, the operator asks the subject to think back to when he received the pinch, and the needle should replicate a motion very similar to that produced when he physically received the pinch.

Similarly, is possible to recall events in the subject's past, pleasurable or painful, and check the effect on the needle.

The "pinch test" is a first step to convince the subject. Further it is possible that he no longer trust himself, their perceptions and their memories, because maybe the meter does not validate them.

The subject is gradually led to believe in the machine and in the operator's explanations, who can create convictions and false memories from nothing.

These experiments, when repeated following a scheme, can be dangerous, and potentially damaging. It is a job that encroaches in the field of psychotherapeutic treatment, and which can not, and should not be carried out by unskilled and not prepared personnel.

In conclusion, the interpretation of the needle movements for therapeutic purposes, and in any case for purposes other than simple scientific research statistics, if not associated with specific skills, can lead to erroneous conclusions. But even worse, it can be used to manipulate the subject for profit.

Therefore, the Theremino team dissociates from using the tool for these purposes. We will not give any support or advice about it.

What is measured

What is measured is always and only the electrical resistance caused by the contact between the skin and the metal electrode.

Input signal

Input	841
Rx (ohm)	116 K
Tone Arm	5.64

Dry skin is completely insulating so that the contact resistance varies according to sweating. And of course sweating is linked to emotional state.

The contact resistance also varies according to the variations of the pressure that is exerted on the electrodes.

After some time (which the literature on eMeter called "heating") electrolyte paths are established between skin and metal, caused by sweat and the salts that it contains. Under these conditions unconscious and minimum variations of the pressure are enough to cause significant resistance variations.

What is not measured

The resistance of the body between the two hands is so low compared to the contact resistance, it does not affect at all.

The differential voltage between the hands, caused by galvanic effects and the body's electrical activity, affects fewer still.

Hard to believe anyone who says that spiritual activities influence the properties of matter. Of course we do not yet know everything, but so far no experiment has ever been able to demonstrate a connection like that.

Normal resistance

The normal resistance values ranging from 10K ohms to 200 K ohms

In some publications on the subject is talking about a normal resistance of 5 kohms, but no doubt the resistance "normal" or "average" is at least ten times higher.

In the original publications we reading about 5 kohms for females and 12.5 kohms for males. But just do a little of measures to be convinced that they are totally wrong values. The original publications contain a lot more imaginative (if not foolish), Hubbard even wrote: *"dead female body is a 5 kohm resistor..."*

Further information on measures in the file [EmotionMeter_Hardware](#).