

# CLICKSCRATCH

*Version 2.0, Joel Bouchat, November 2018.*

## **Presentation:**

ClickScratch is an application to help you to restore and digitize (!) your vinyl LP records.

ClickScratch combines an automatic "click detector & repair" facility with an interactive click editor. This editor is easy to use.

ClickScratch includes a real time audio capture, and it can also load pre-recorded files in "wav" or "flac" format.

Notice that this application is optimized for discs in good condition with only small clicks. It will not give good results on discs with deep scratches and it cannot be used for restoring old 78 RPM shellac discs.

The capture implements the "click detect & repair" in real time. The "audio monitoring" facility can be used for direct listening to your "cleaned" LPs played on your turntable, while recording them or not.

The Capture Dialog Box is described in the last paragraph.

## **What's new in version 2.0 ?**

- In complement to ".wav" files, ClickScratch supports also ".flac" files, in input and output. Both format are lossless, with an identical quality, but an audio source encoded in "flac" format is compressed and it is typically reduced to 50–70% of its original size.
- When you save the audio file to the disk, the click "markers" are saved inside the file metadata. Therefore, you can recover your work from one session to another. This is true both for ".wav" and for ".flac" files. The "tag" used is a standard "General Encapsulated Object (GEOB) tag. It is small and "transparent" for any audio player.
- Rather than systematically applying the "Click Detection & Repair" to the whole file, it can now be applied to a selected block of samples. The selection is interactive, with the mouse.
- The block selection can also be used for playing "in loop" a small part of the track to detect audible clicks.
- The ergonomics has been improved with shortcuts: mouse wheel plus arrows for the displacement, '+' '-' for zooming, 'p' for playing and 's' to stop playing.
- The "Click Detection & Repair" algorithm has been improved too.

## **The Main Dialog Box:**

Once captured, the two audio tracks (left and right channels) appear in the main editor, with a marker for every detected click.

Every click is shown in the twin channel window, from there you can modify the markers, cancel the false detections and add extra markers.

You can listen to the resulting audio quality. The file is played from the cursor position materialized by a vertical blue line.

When a block of samples is selected, the audio is played from the start of the block up to its end.

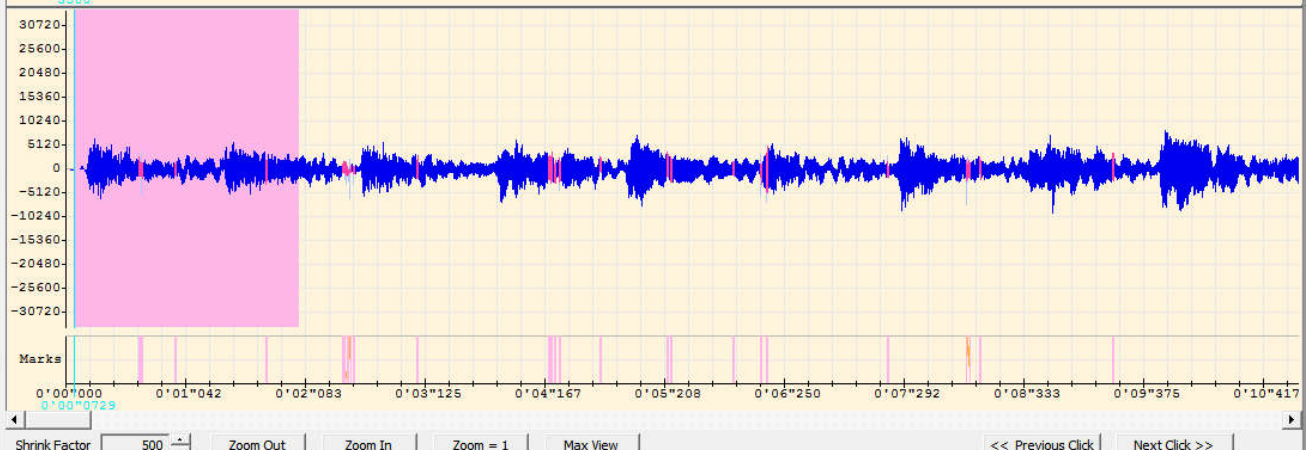
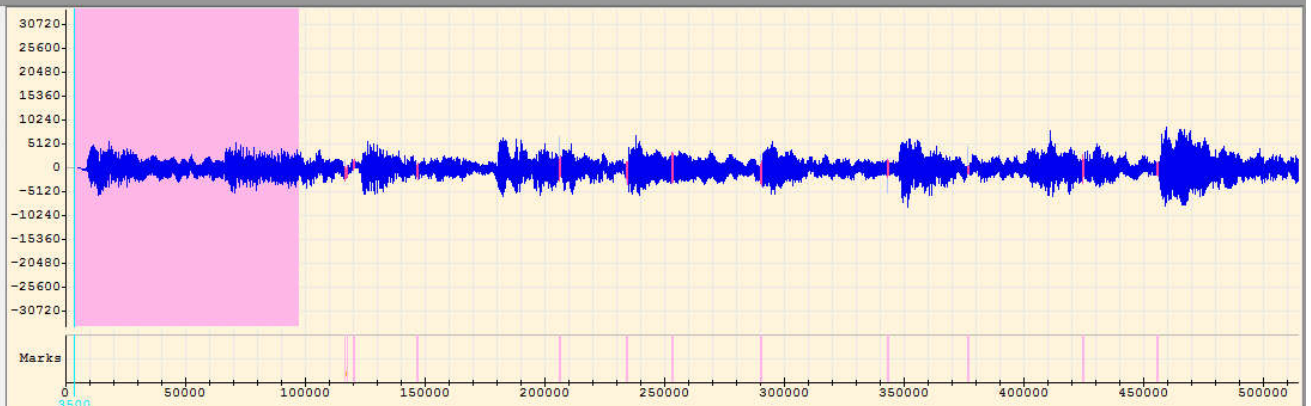
Audio Source  
Load File  
Audio Capture

View  
Abscissa  
 Sample  
 Time  
 Both

Click Repair  
Sensitivity  
Max  
Block Repair

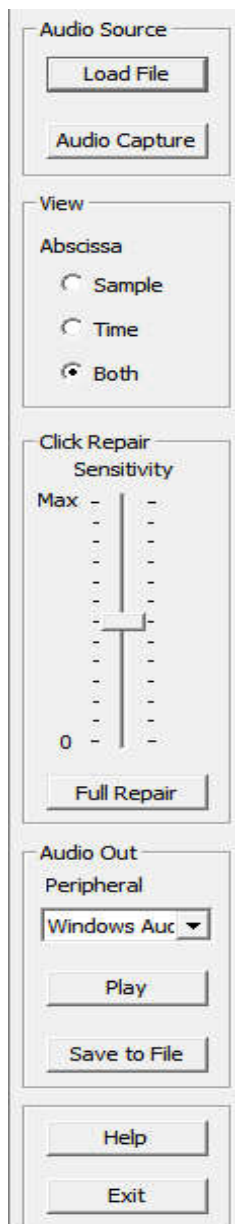
Audio Out  
Peripheral  
Windows Auc  
Play  
Save to File

Help  
Exit



Shrink Factor 500 Zoom Out Zoom In Zoom = 1 Max View << Previous Click Next Click >>

## Left Control Panel:



ClickScratch includes a real time audio capture, but it can also load an existing file. Only monophonic or stereophonic 16 bit PCM ".wav" or ".flac" files are supported. The file must be sampled at 44.1 or 48 kHz..

Clicking on the "Audio Capture" button launches the "Capture" Dialog box described at the end of the document.

The abscissa can be scaled in samples or in time (minute, seconds, 1/1000 s).

When "both" is selected, the upper track (left channel) is graduated in samples and the lower track (right channel) has a time scale.

The "**Sensitivity**" of the detection can be adjusted during the capture or after the capture, while editing. After having modified the sensitivity, another "Click Repair" can be performed without impacting the original audio quality or losing the work already done. When a repair is performed with the sensitivity set to '0' no click detection is done and no marker will be present, except the markers that you have already adjusted or added.

A too high sensitivity creates a lot of false detections, and a lot of audible distortions, but this may be a good choice for manually editing the markers, since it is easier to erase some markers than defining new ones!

At anytime the audio tracks can be played on the selected audio output peripheral, from the cursor position, or from a the start of a selection block.

Once you work finished, the restored audio can be saved to a PCM ".wav" or ".flac" file, with the same sampling rate as the original tracks.

## Bottom Control Panel:



The display can be horizontally shrunk down to 1/10000, using the spin arrows. For easier handling, those arrows are completed with three buttons: "**Zoom Out**", "**Zoom In**", "**Zoom = 1**" and "**MaxView**". You can also use the '+' and '-' keys as shortcuts. Notice that "zooming" is not really possible, the larger scale factor is '1' with one audio sample per horizontal pixel. Only "shrinking" is possible! The full scale view is directly accessible through the "**Zoom = 1**" button and the maximum shrinking is accessible through the "**MaxView**" button.

When the scale factor is modified, the diagram is centered at the cursor position.

The button on the right side, "Previous Click" and "Next click" are very useful for navigating from one click marker to the next one during the edition work.

The classical horizontal scrolling bar is located above those buttons. Horizontal scrolling is also possible with the mouse wheel.

## Tracks & Markers:



At scale 1, the audio tracks are represented on an horizontal axis of one pixel per sample, and each sample has a value going from -32768 to +32767 (16 bit PCM) on the vertical axis. The left channel is on top.

The click markers are displayed inside the "marker row", located under each audio track. Every click is represented by a small rectangle in **red color**.

Inside the rectangle you can see a small "lump" which gives an idea of the filtered click amplitude.

The repaired track samples are also represented in red color, while the original signal is now displayed in pale blue.

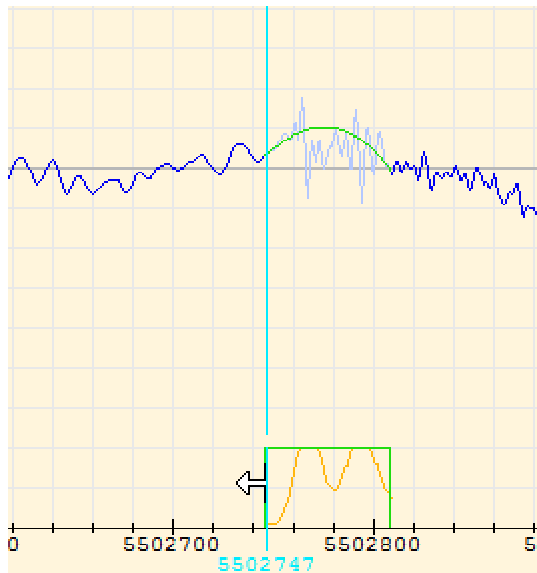
The vertical blue line is the cursor that you can position with the mouse. (left click).

If you maintain the "CTRL" key while clicking on the graphic, the display is scrolled horizontally to the cursor position.

When the scale factor is modified, the diagram is centered at the cursor position.

To **add** a new **marker**, just click inside the concerned marker row. **Editing** a marker is explained in the next chapter.

## Editing a Click Marker:



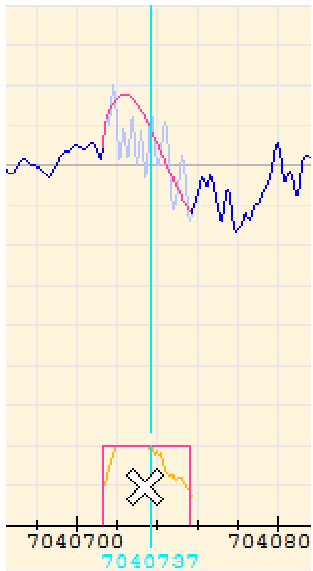
To edit the size of a marker, click on its left or right side and move it with the mouse.

The mouse cursor represents an arrow.

Once that a marker has been edited (= modified) it is represented in **green color**. This is also the case for the fixed samples on the corresponding audio track.

If you re-do an automatic "Click Repair" afterwards, those green markers **will not be modified**.

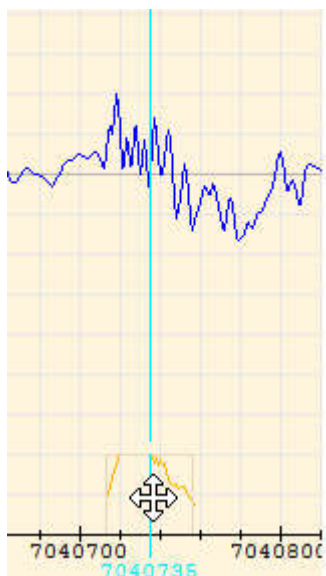
To allow a green marker to be automatically modifiable again, you need to erase and restore it by two successive mouse click in the rectangle



To **remove** a click marker, simply click inside its rectangle.

The mouse cursor represents a crossbuck.

Once deleted a marker has no more effect on the audio track, but its trace remains visible.

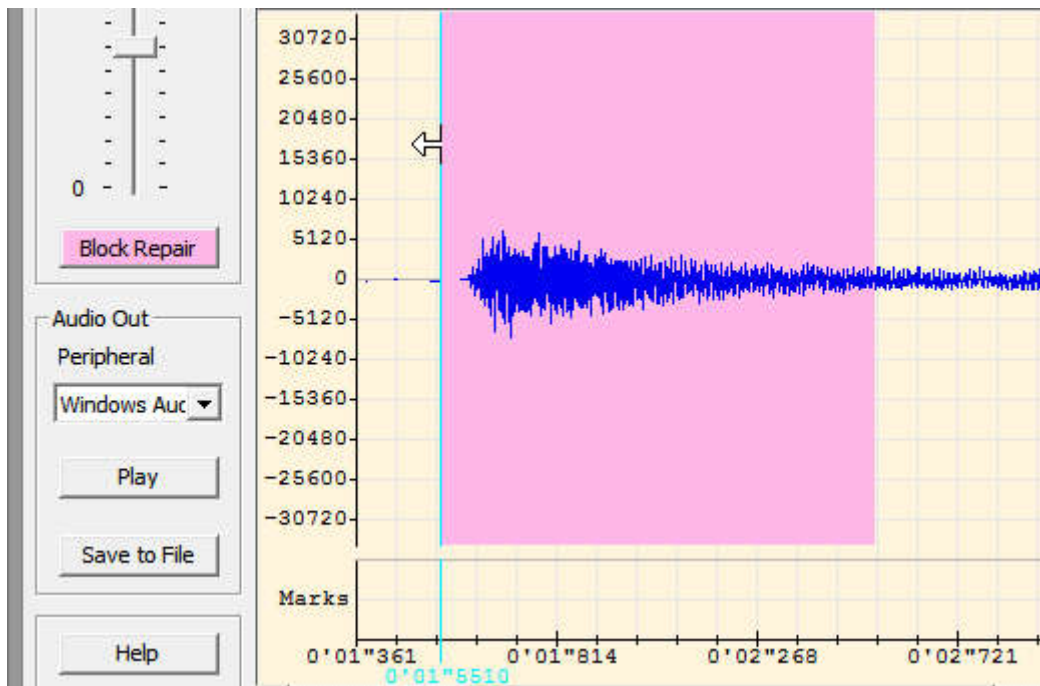


To **restore** a marker click inside its marker which is attenuated but still visible.

The mouse cursor represents a cross with arrows.

If, you re-do an automatic "Click Repair" afterwards, those erased markers **will not be restored**.

## Selecting a block of samples:



Selecting a block of samples is extremely easy: left click on a track oscillogram and move the mouse! The selection rectangle is drawn in pink color.

Notice that this can only be done when the shrink factor is lower or equal to 1000. This restriction is caused by the high CPU load induced by high shrink factors.

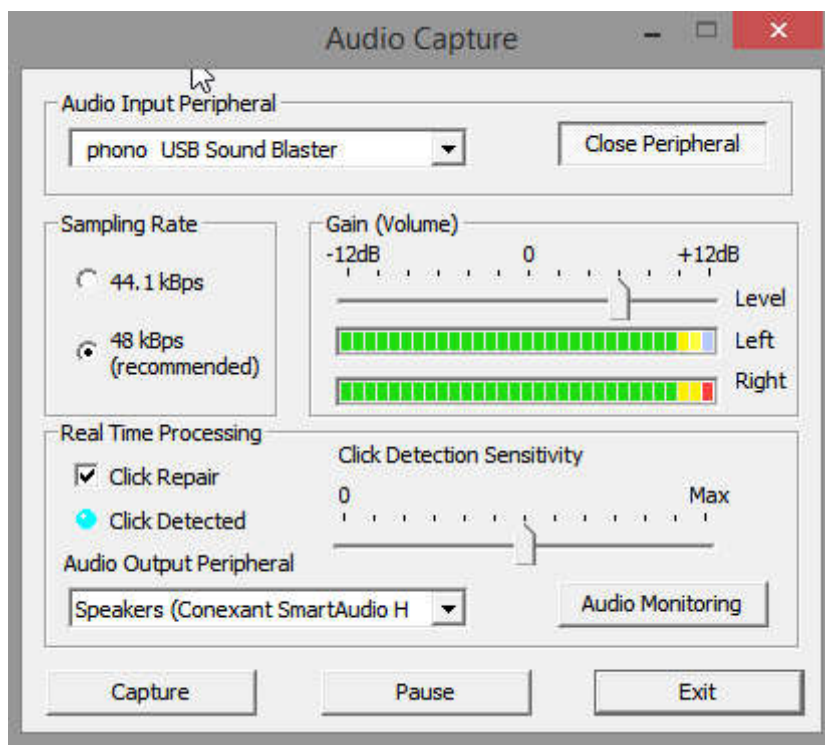
You can always modify the size of the selection by clicking on its left or right border and move it with the mouse. In this case, the mouse cursor represents an arrow.

The two tracks of a stereo source are always selected together.

Once that a block of sample is selected, the "Repair" button indicates "Block Repair", on a pink background, to indicate that the click detection and repair will be only applied to the selected samples.

To cancel the selection, just click outside the pink rectangle or use the "escape" key.

### The Real Time "Audio Capture" Dialog Box:



First, select the sampling rate. Theoretically 48ksps gives better results than 44.1 ksps, but there is very little difference in practice.

On the top you must select your **Audio Input Peripheral**. Typically the "Phono" input on which your turntable is connected. This input has an high sensitivity and implements the RIAA equalization to compensate for a pre-equalization done before the disc cut.

Next click on the "**Open/close Peripheral**" button (toggle mode).

When the Audio peripheral is opened, the **Vumeters** are active and you can adjust the **Gain** with the slider. Contrarily to the example shown, avoid to light up the red Led!

When the "**Click Repair**" checkbox is selected, the click detection is activated and each time that a click is detected the **blue led** flashes.

If you have two audio cards or an audio card which allows recording and playing back simultaneously, you can select an "**Audio Output Peripheral**" and activate the "**Audio Monitoring**" to aurally control the audio quality and the effect of the click removal.

**Remark:** for the monitoring, the analog audio loop-back of your sound card must be deactivated. Also, do not select as audio input the "Wav out Mix" or "What you are listening to" this loop would create echo and distortion !

Use the "Click Detect" Led and/or the "Audio Monitoring" to adjust the "Click Detection Sensitivity". For real time listening, the minimal effective sensitivity is the best choice. A high sensitivity creates a lot of false detections, and thus a noticeable audio distortion.

With or without the "Audio Monitoring", you must activate the "**Capture**" to **record** the audio on the disk.

When the "Capture" button is toggled off, the capture is terminated and the audio signal is displayed in the main application window. You can "**Exit**" the "Audio Capture" dialog box to return to the main window.

The "Sensitivity" setting has **no impact on the recorded audio**. It only impacts the number of "Click marks" that will be displayed in the main window, and you can always modify the sensitivity later, as explained in the previous paragraphs.