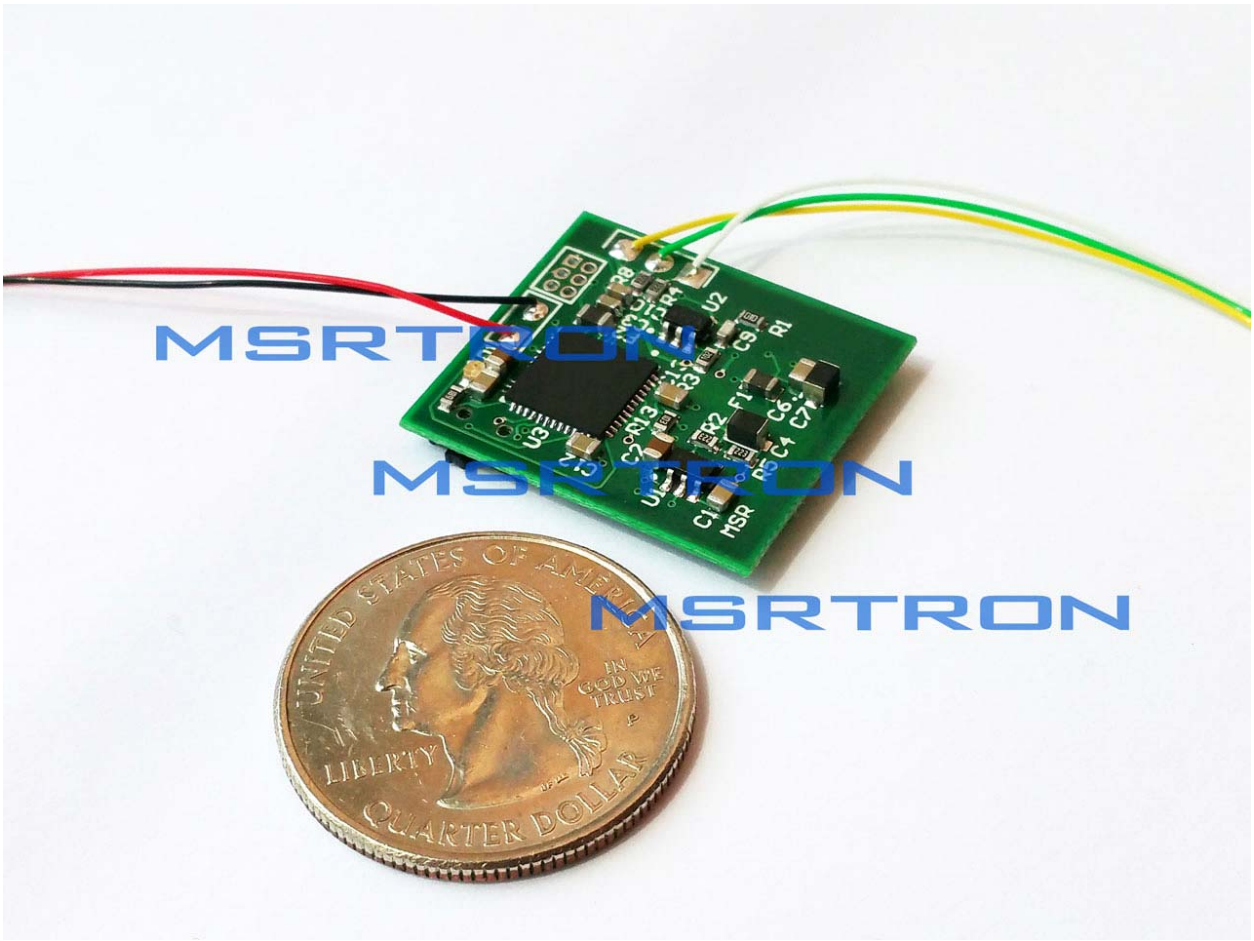
MSRTRON

MSR-Audio User Manual



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1 Hardware specification

1.1 General specification

PARAMETER	MIN	TYP	MAX	UNIT
V_{IN} Input voltage	3.2		5.5	V
I_{IN} Input current – Sleep		1.3	3.0	mA
A_{G1} Magnetic Head Gain Track 1		100		
A_{G2} Magnetic Head Gain Track 2		100		
f_{OS1} Track 1 Oversampling		1800		kHz
f_{OS2} Track 2 Oversampling		800		kHz
f_{S1} Track 1 Sample write		138		kHz
f_{S2} Track 1 Sample write		61		kHz
N_S Track 1, Track 2 Resolution		8		bit
R_{IN1} Track 1 Input Impedance	1.98	2.2	2.42	kΩ
R_{IN2} Track 2 Input Impedance	1.98	2.2	2.42	kΩ

1.2 Layout

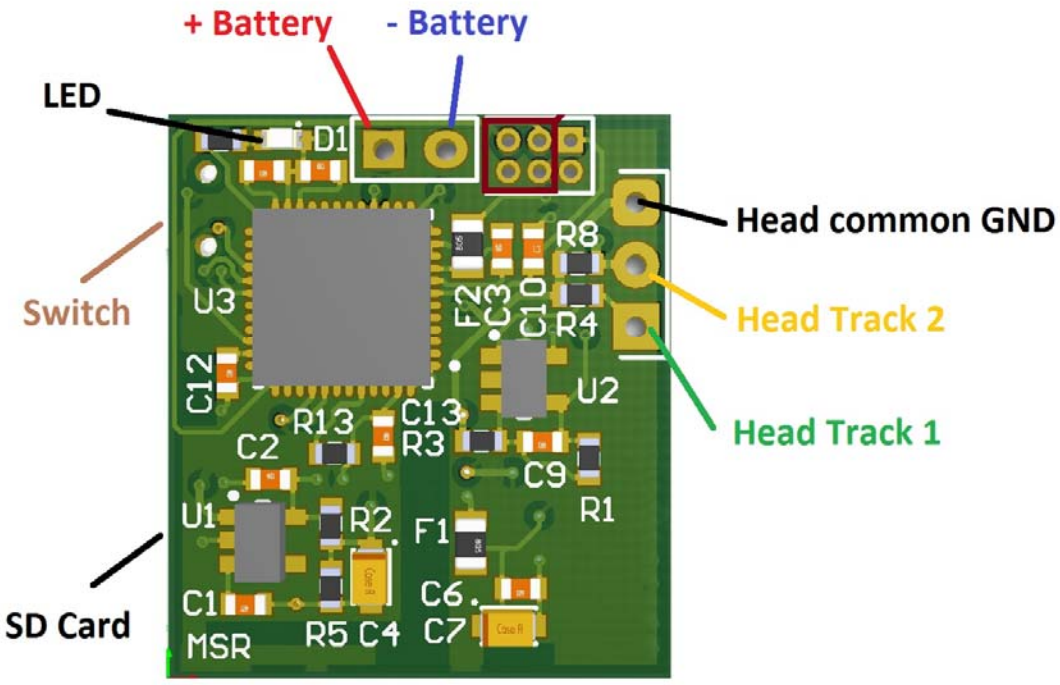

Figure 1. Top side PCB layout

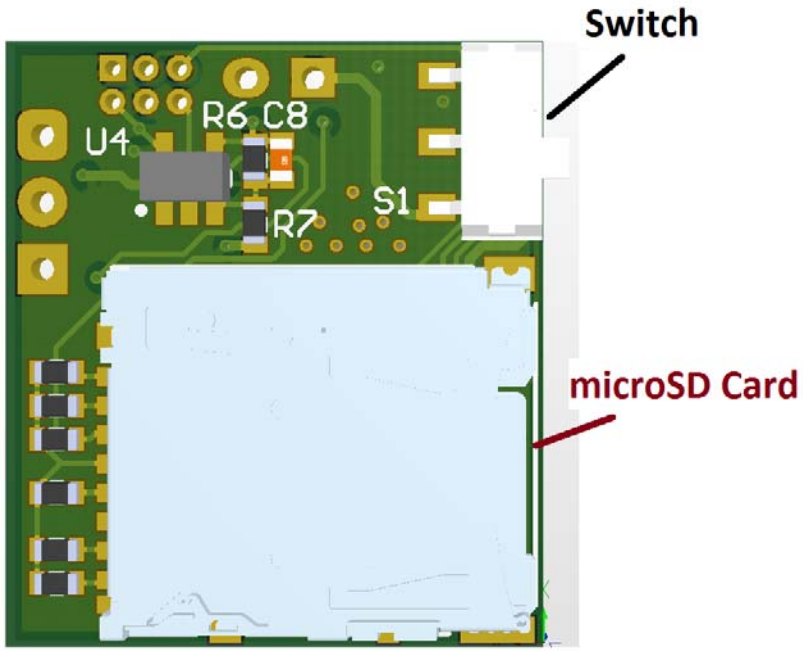

Figure 2. Bottom side PCB layout

1.3 SD Card and WFM file

The reader stores sampled data on the SD card. The SD card must be formatted with a FAT32 file system. The recommended SD card size is 2GB or 4GB. A .wfm file is created for each swipe. This file is created with a unique id and timestamp. The file contains both Track 1 and Track 2 data. The file also contains a footer area (at the end of file) where the reader stores the timestamp and the ID of the swipe.

Filenames are generated by combining the swipe ID with the MSR prefix. Successive swipes have successive Ids, e.g., a read with the ID = 00000, is stored in *MSR00000.wfm.* The following swipe has the ID = 00001, which generates the *MSR00001.wfm* filename.

Two swipes are stored in independent files if the pause between them was longer than the defined time delay. This delay is defined by using the jumpers on the PCB or by using the configuration file on the SD card (if a configuration file is stored on the SD card, the reader ignores the jumpers, i.e. the SD configuration has a higher priority). 4 different delay time options are available: *0 sec, 0.5 sec, 1 sec, 1.5 sec.* Swipes which happen before the defined delay has passed are stored in a single file, and are considered interrupted.

1.4 Delay time selection

Delay time selection can be done by defining a configuration file on the SD card.

1.4.1 Configuration file

If a configuration file is present in the root directory of the SD card and if there is a valid delay configuration command defined in the file, the reader ignores the jumper configuration and sets the configured delay from the file. The configuration file must be named: **msr_conf.cfg**. Valid delay configuration commands are:

DELAY 0 – *for 0 seconds*
DELAY 1 – *for 0.5 seconds*
DELAY 2 – *for 1 seconds*
DELAY 3 – *for 1.5 seconds*

The configuration file is read during the SD card initialization.

Besides defining the delay time, the configuration file can be used to set the reader's ID counter to zero:

RESET COUNTER TO ZERO

When the MSR is rebooted with a *RESET COUNTER TO ZERO* command, it restarts the ID count to 0 after each restart. It is possible to set the delay time and reset counter to zero in a single configuration file.

1.5 LED indicator

The LED indicator signalizes the current state of the MSR. The device can be in 2 error states, an active read state (with signal present on the read head), a waiting read state (no signal on the read head), and a sleep state.

1.5.1 Fast blinking

Fast blinking LED indicates the first error state. This error is caused by failure to initialize the SD card. While in this state reader continuously retries to initialize the SD card.

1.5.2 Slow blinking

Slow blinking LED indicates an error during data write to the SD card. This can happen if the SD card is taken out of the reader before ending the swipe. Some older SD cards have non-deterministic time of access which can result in read buffer overflow.

1.5.3 LED indicator off

If the LED indicator is off with the power switch turned on the MSR is running in sleep mode. Sleep mode is a low current drain mode; the reader wakes up if it detects a signal on the read head. This type of operation provides large power savings and allows for longer operation of the device.

1.5.4 LED indicator bright

Constant bright LED light indicates active read state. This means that the reader is measuring generated voltage on the read head, and is streaming the data to the SD card.

1.5.5 LED indicator dimmed

Dimmed LED indicates a waiting for signal read state. This state happens when there is no generated voltage on the read head, but the swipe delay time has not yet passed. If a voltage is detected during the delay, the reader reverts to active read mode. Otherwise, it saves the .wfm file and goes back to sleep.

2 PC application

2.1 Getting started

The MSR Tron MSR-Audio Software Suite allows the user to interpret the data analogue data recorded by the reader. Figure 3 shows the main application screen.

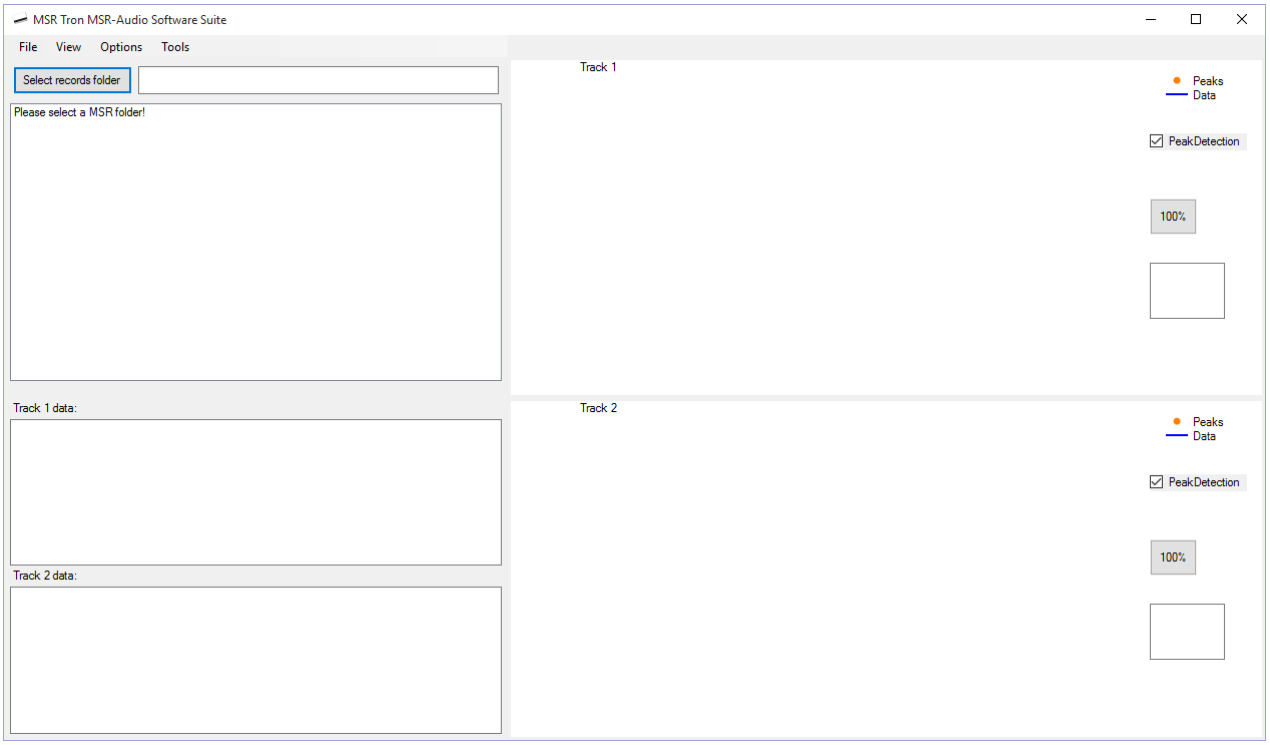

Figure 3 Main application screen after start

The application automatically finds drives labelled MSR (i.e. the SD card used for reader operation should be named MSR to use this feature). The user can also select a records folder manually using the Select records folder button. The dialog is shown in Figure 4.

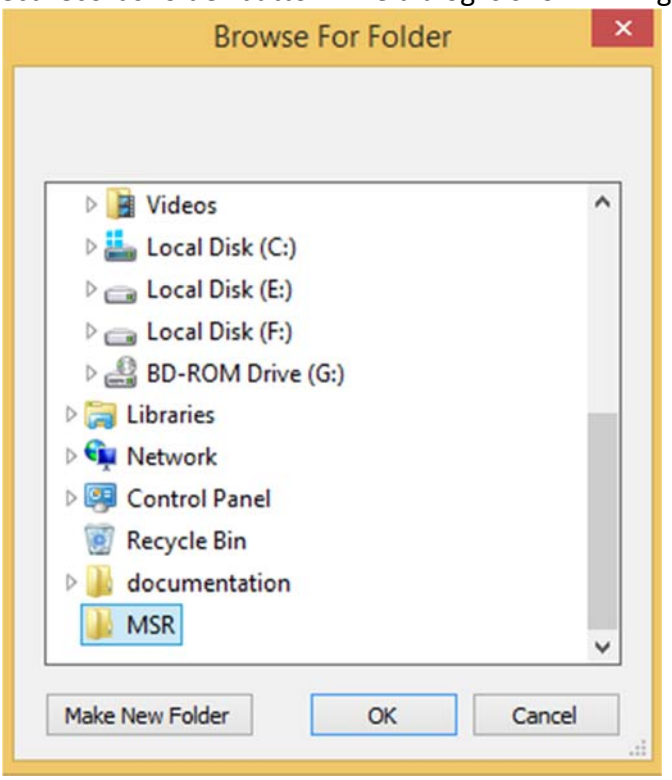

Figure 4. Select folder dialog

When using this dialog, the user browses to a folder (not to a file). After the application gets a records folder, automatically or manually, a list of all available .WFM files is shown. (Figure 5)

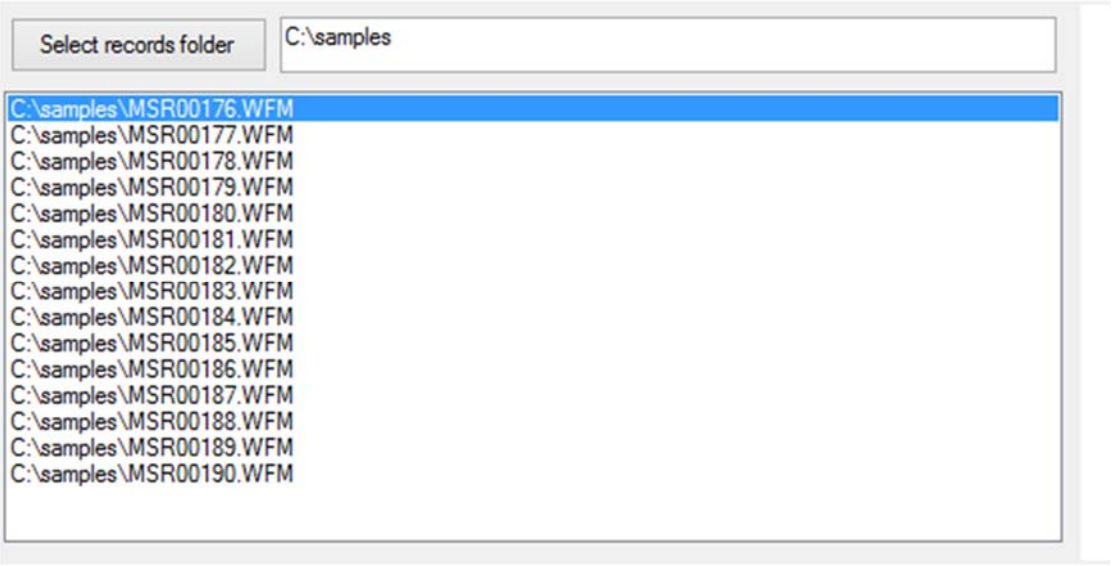

Figure 5. A list of .WFM files loaded from a folder on the hard drive

When an entry in the file list is clicked, the application runs the decoding algorithm. Decoded data, as well as the timestamp, duration and ID of the swipe for Track 1 and Track 2 are displayed in their respective text boxes (Figure 6).

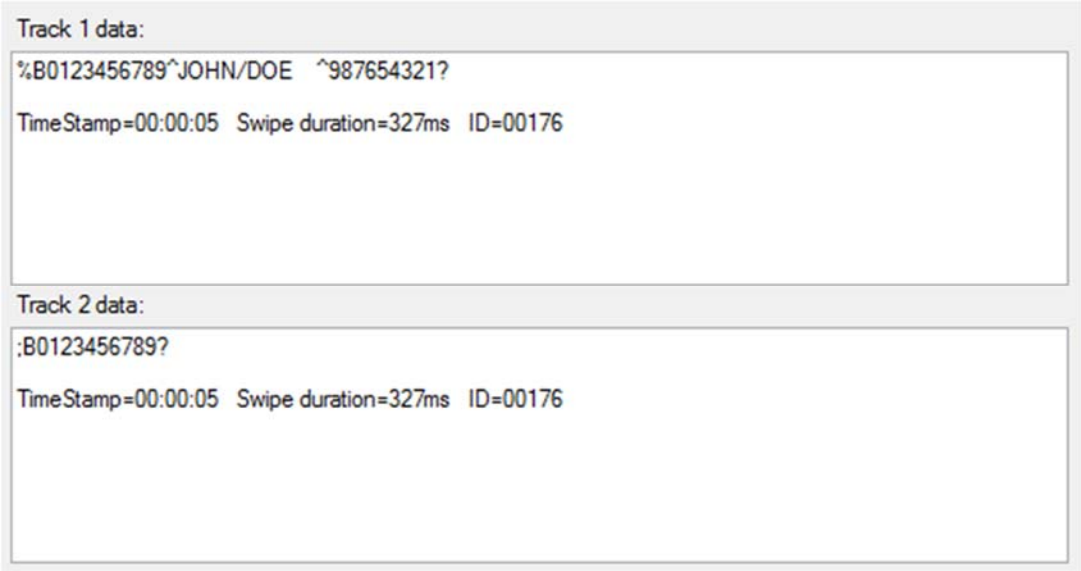

Figure 6. Text output

If the plotting is enabled in the Options/Plot menu (Figure 7), selecting a file redraws the data waveform. (Figure 8)

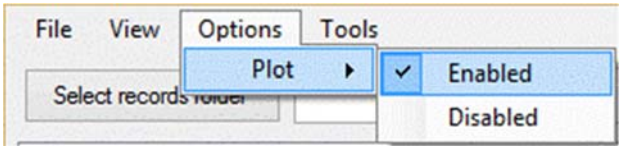

Figure 7 Plotting enabled/disabled menu

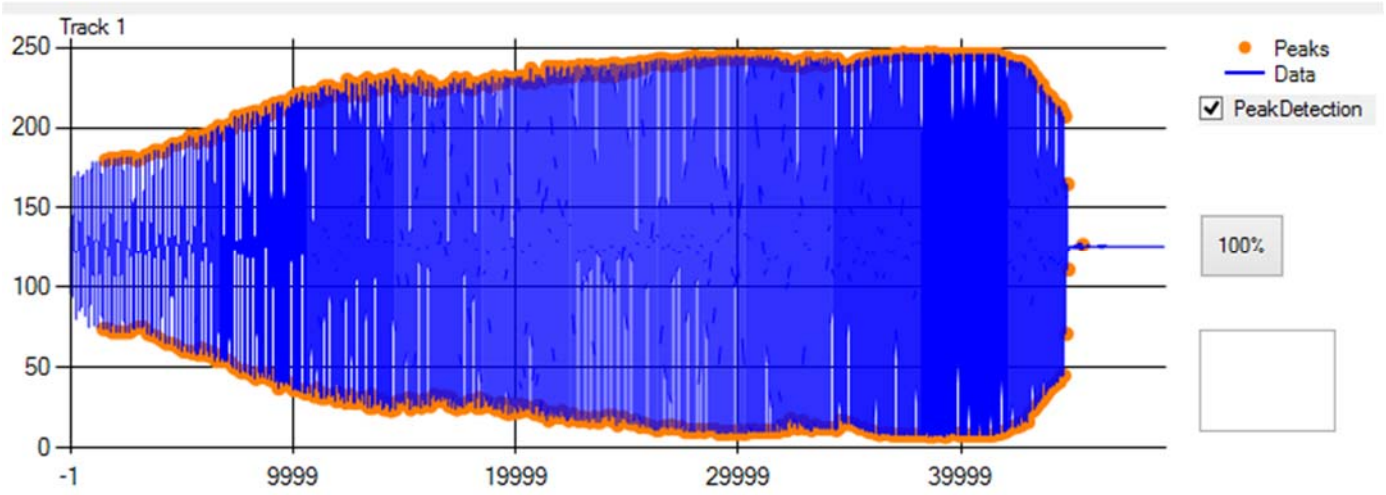

Figure 8. Example waveform plot

2.2 Wave file options

The application Tools menu provides wave export features. (Figure 9)

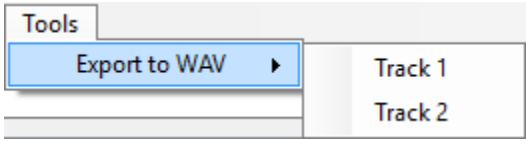

Figure 9. Wave handling menu

Track 1 and 2 are recorded separately when converting to wave format. This feature is useful for using external tools for editing the signal waveform.

2.3 Graph editing features

The application provides several wave editing features.

2.3.1 Left click drag

The user selects an area of the graph by left clicking at the starting position, dragging, then releasing the left click at the end position.

2.3.2 Right click drag

The user can move around the graph by using the right click and drag. The graph is dragged with the mouse.

2.3.3 Right click context menu

This menu is brought up by right-clicking the appropriate graph without dragging the mouse. (Figure 10)

Figure 10. Right click context menu

2.3.4 Crop

A standard crop functionality implementation. User selection stays in the waveform while the not-selected data is removed. (Figure 11)

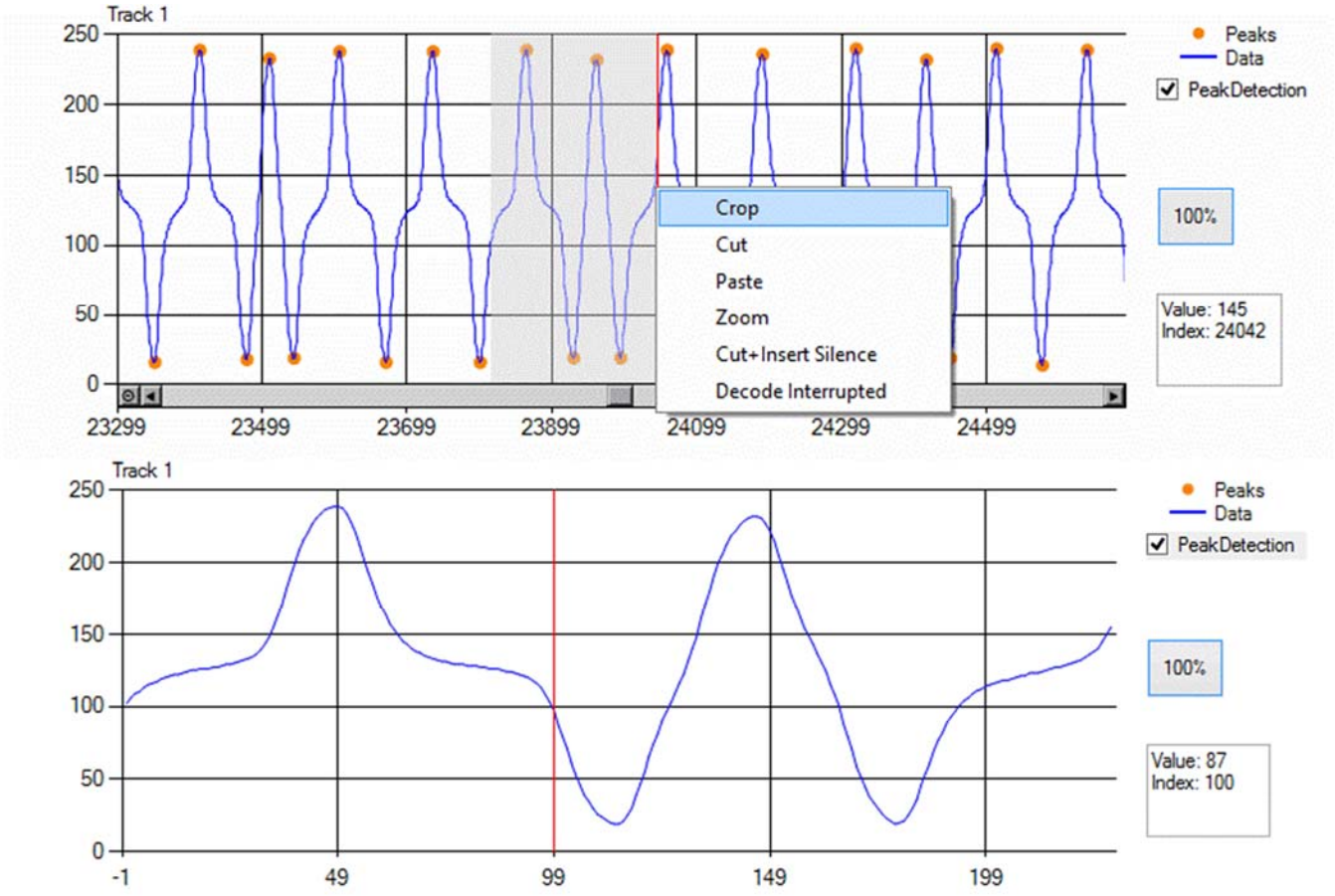

Figure 11. Crop functionality

2.3.5 Cut

A standard cut functionality implementation. User selection is cut from the waveform. (Figure 12)

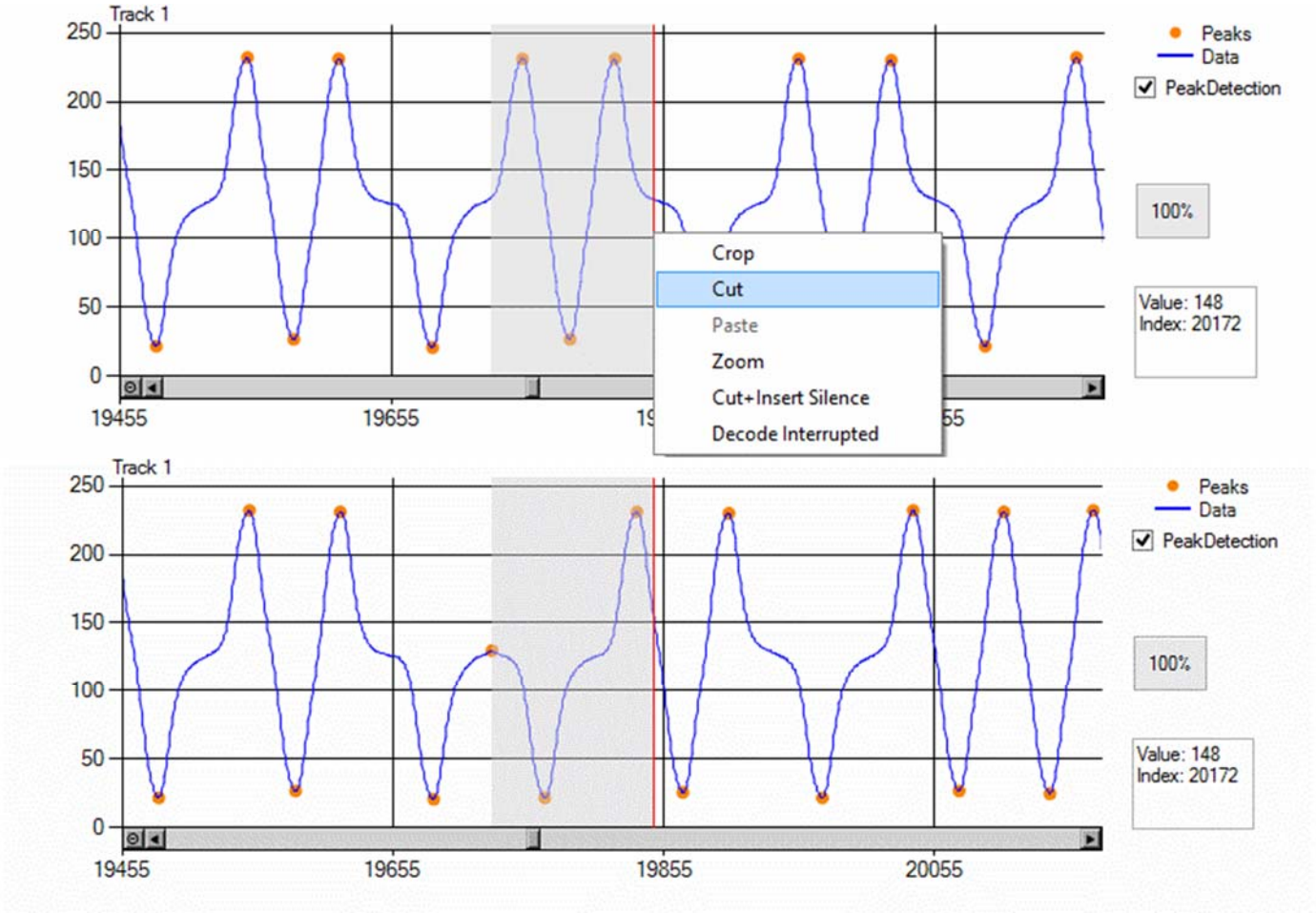

Figure 12. Cut functionality

2.3.6 Paste

Pastes cut data to the location specified by the user selection. (Figure 13)

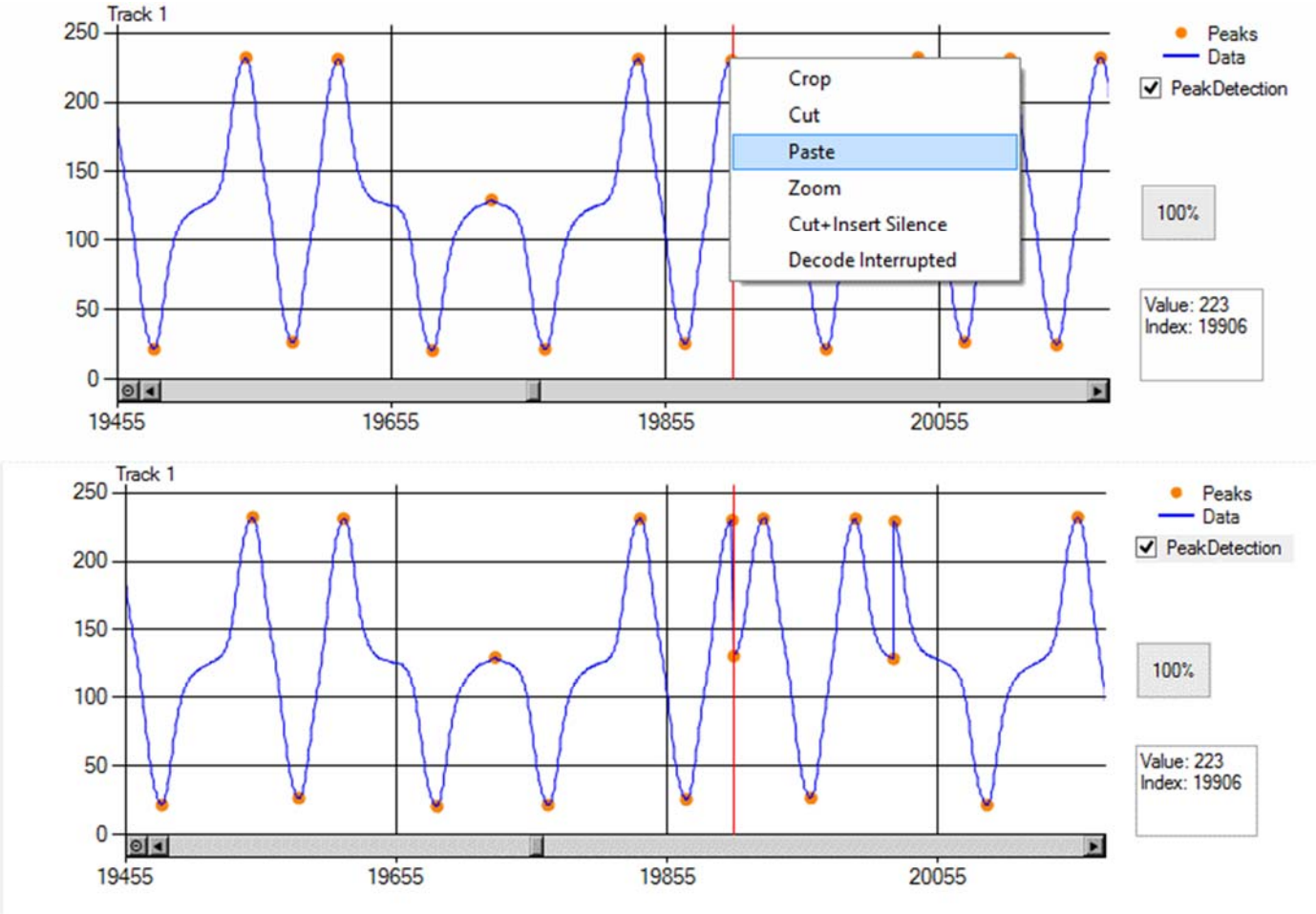

Figure 13. Paste functionality

2.3.7 Zoom

Zooms to area selected by the user. (Figure 14)

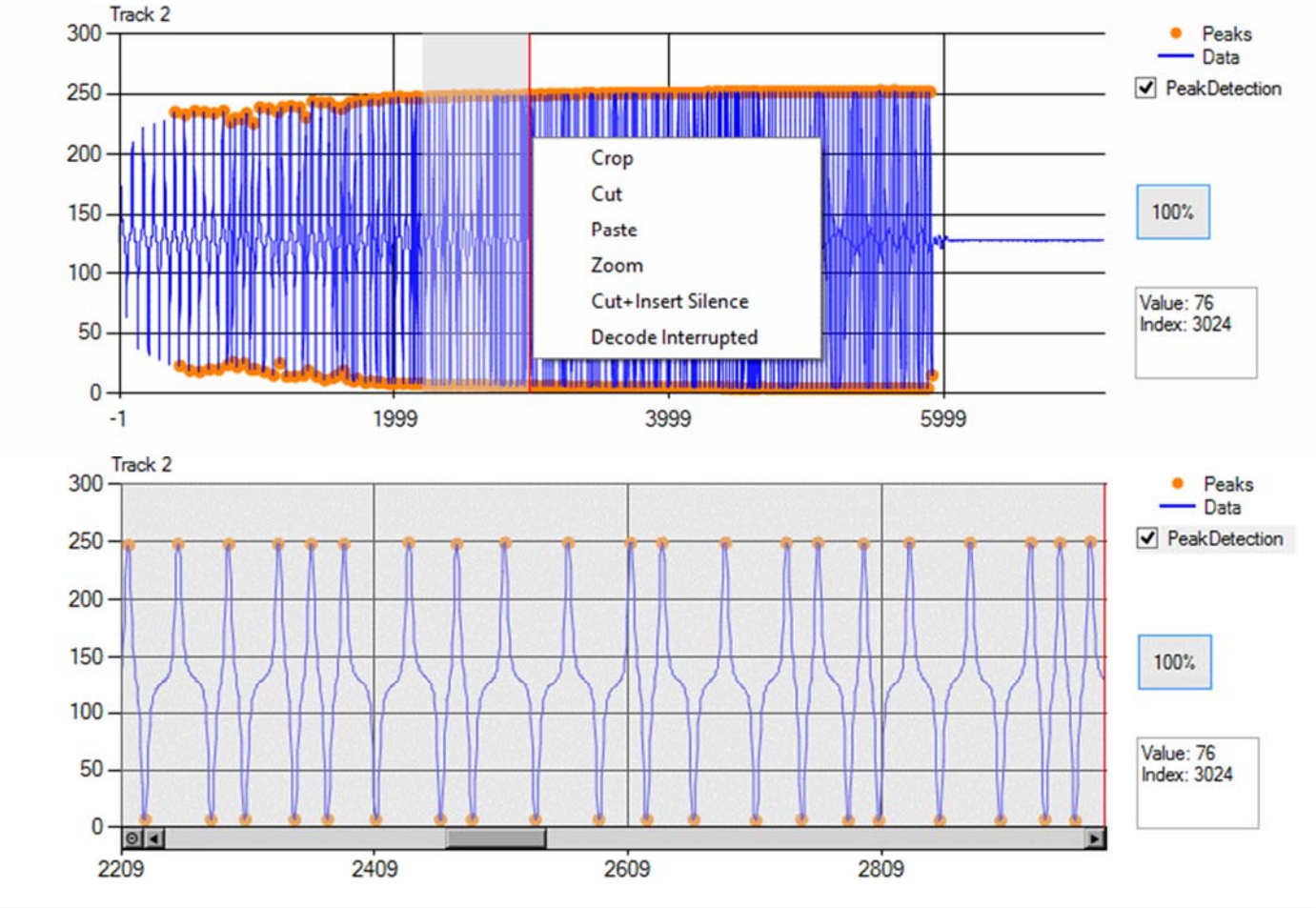

Figure 14. Zoom functionality

2.3.8 Cut + Insert Silence

Cuts the user selection out, and inserts silence instead. (Figure 15)

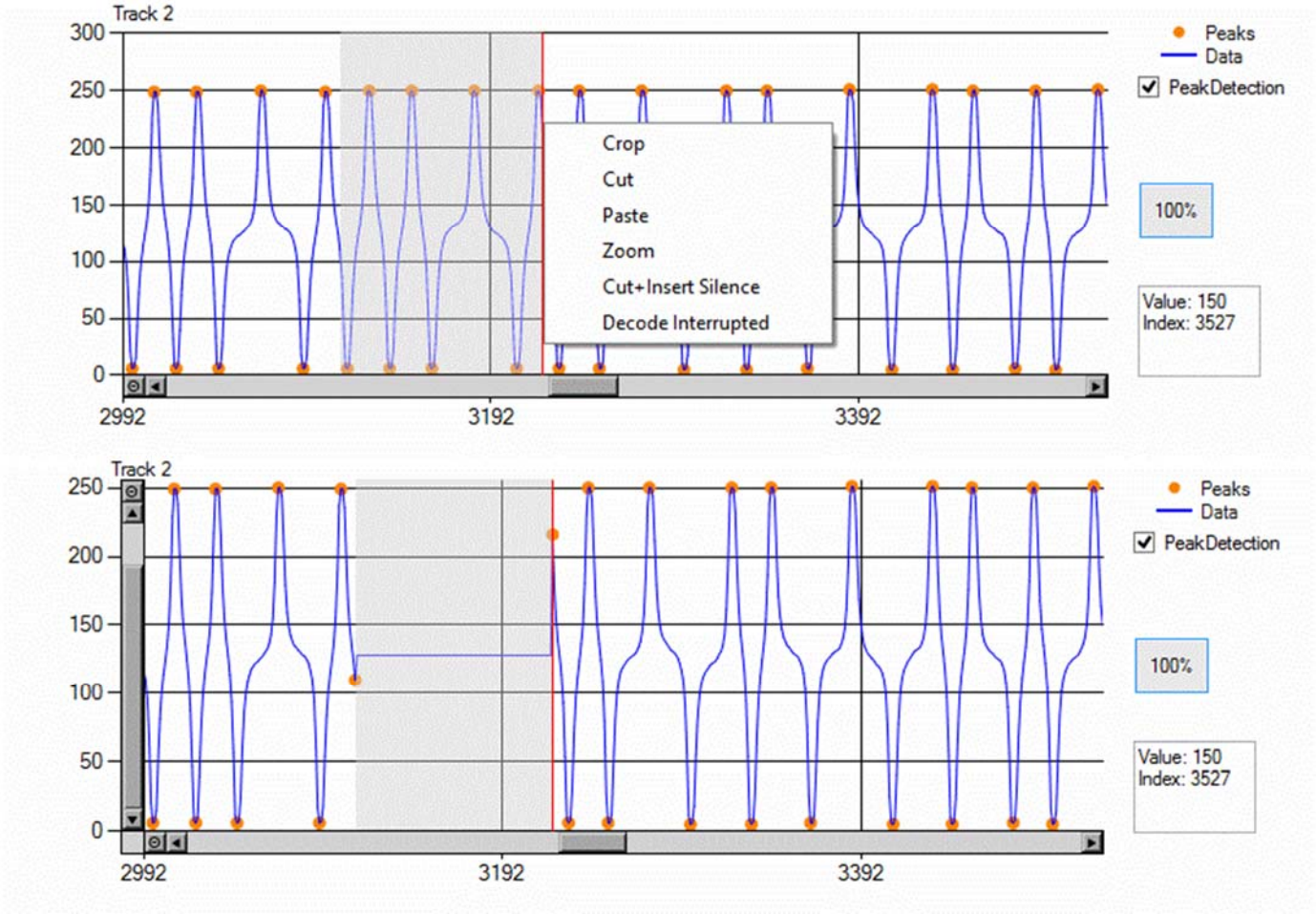

Figure 15. Cut + Insert silence functionality

2.4 Decoding interrupted waveforms

To decode interrupted waveforms the user must select the interrupted area and pick the Decode Interrupted option. Some magnetic stripes do not provide a proper postamble part so the right side of the interrupted signal depends of the card writing process. The reader inserts the <interrupt> tag in the output string to help visualize the interrupted data. (
Figure 16)

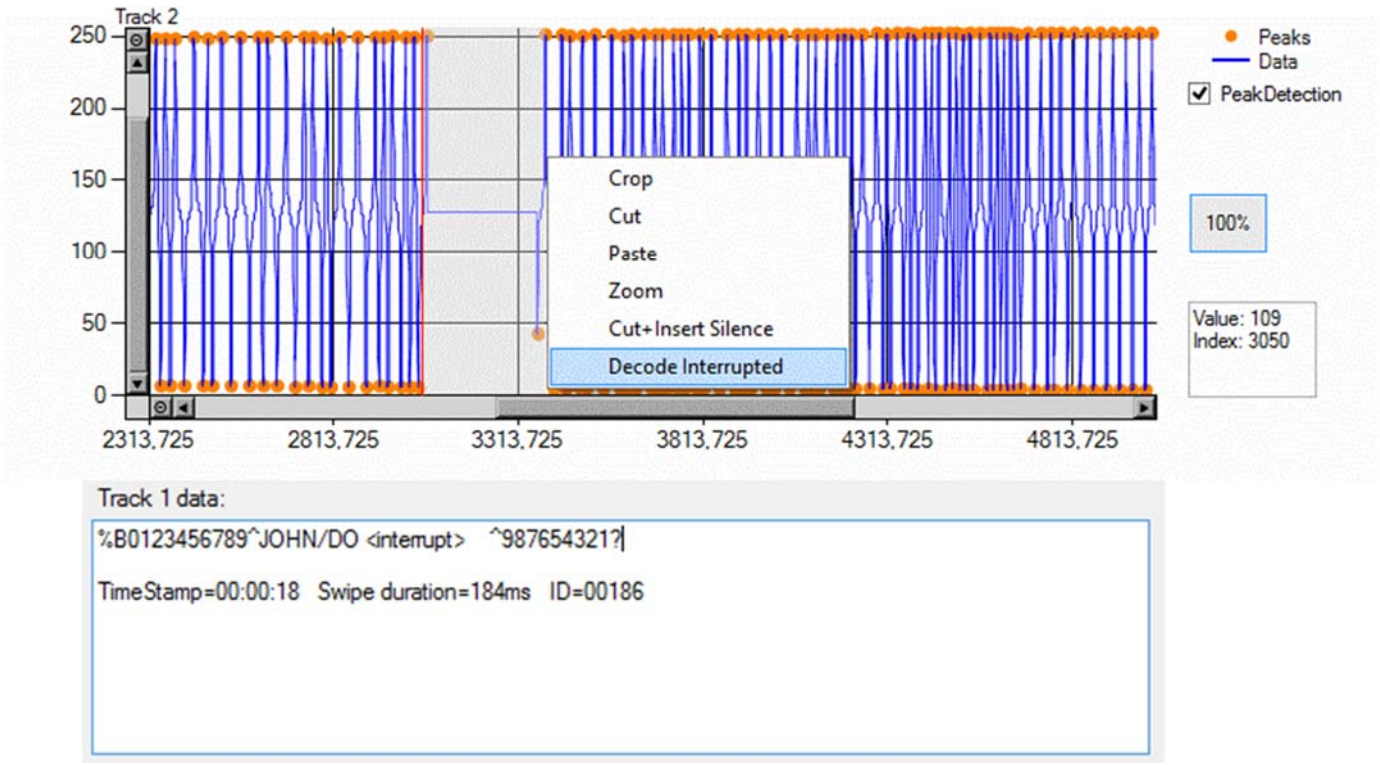

Figure 16. Interrupted swipe decoder

2.5 Peak time plot

The user can use View/Peak Times Plot to visualize the calculated time differences between peaks in the audio signal. The decoding algorithm is based on using these values to determine bits between '0' and '1'. The graph shown in (Figure 17) represents a proper distribution of 1 and 0 times, the higher times are 0 bits, and they are usually around two times longer than the 1 bits. If the card wasn't in contact with the read head or wasn't swiped correctly the distribution becomes less defined. This tool helps visualize any detection faults.

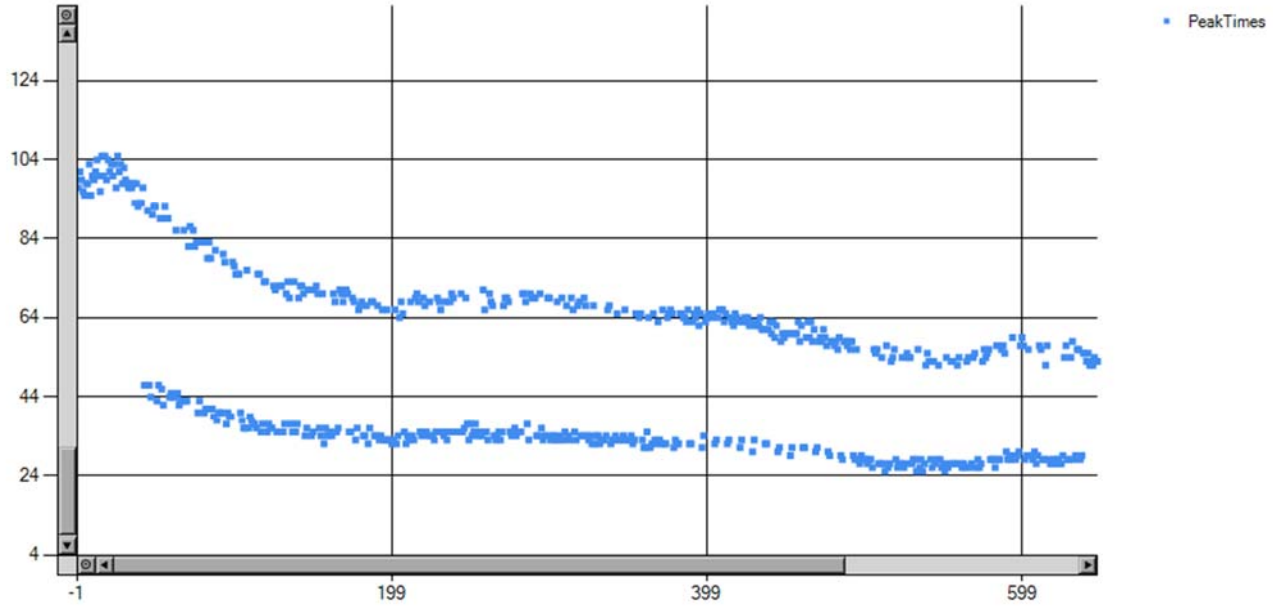

Figure 17. Peak times visualization tool

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