
Acoustic Research Labs Pty Ltd

Firefly



5-a311af6

Revision History

Revision	Date	Author(s)	Description
a311af6	2023-03-02	Juan Aguero	Add sampling rate limitation for octave analysis
5712926	2021-01-05	Juan Aguero	Minor spelling updates
62f7238	2019-02-22	Juan Aguero	Add hardware key detail
f802285	2019-02-21	Juan Aguero	Add screen captures
fe81140	2019-02-20	Juan Aguero	Import from windows help

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1 Introduction

FireFly is a powerful post processing package designed by Acoustic Research Labs Pty Ltd to be used in conjunction with Ngara. It provides the ability to analyse data produced by a Ngara sound acquisition system quickly and easily.

Through FireFly it is possible to generate statistics in many combinations from data generated by a Ngara sound acquisition system. It also allows the calculation of $1/1$ or $1/3$ fractional octave band results if PCM recording has been enabled on the Ngara session.

All results are displayed in an easy to read graphical display, with the ability to zoom into areas of interest and export results into a tabular format for processing by third party applications.

It also allows the user to replay audio recordings at times of interest to confirm noise source.

2 General User Interface

2.1 Main Screen

The main screen of FireFly consists of different windows and tabs, each with a specific purpose. These include;

- Session List Window
- General Statistics Tab
- Wave File Analysis Tab
- Log Display Window

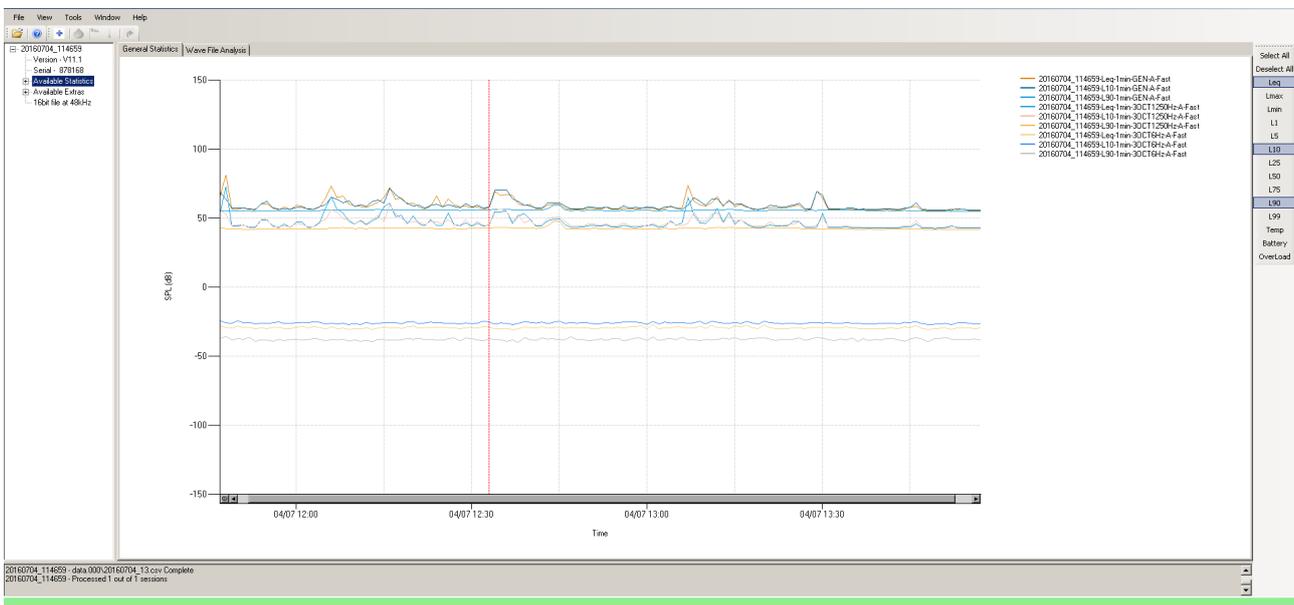


Figure 1: Main Screen

This window displays gathered statistics in a graphical format, with options available for users to customise analysis according to requirements.

2.2 General Statistics Tab

The main window of FireFly displays a graph of the currently selected statistics as a time series plot. This allows a number of operations to be carried out to aid in analysis.

From this window it is possible to:

- Zoom the chart at a section of interest
- Create a chart for each day of the session
- Create frequency charts

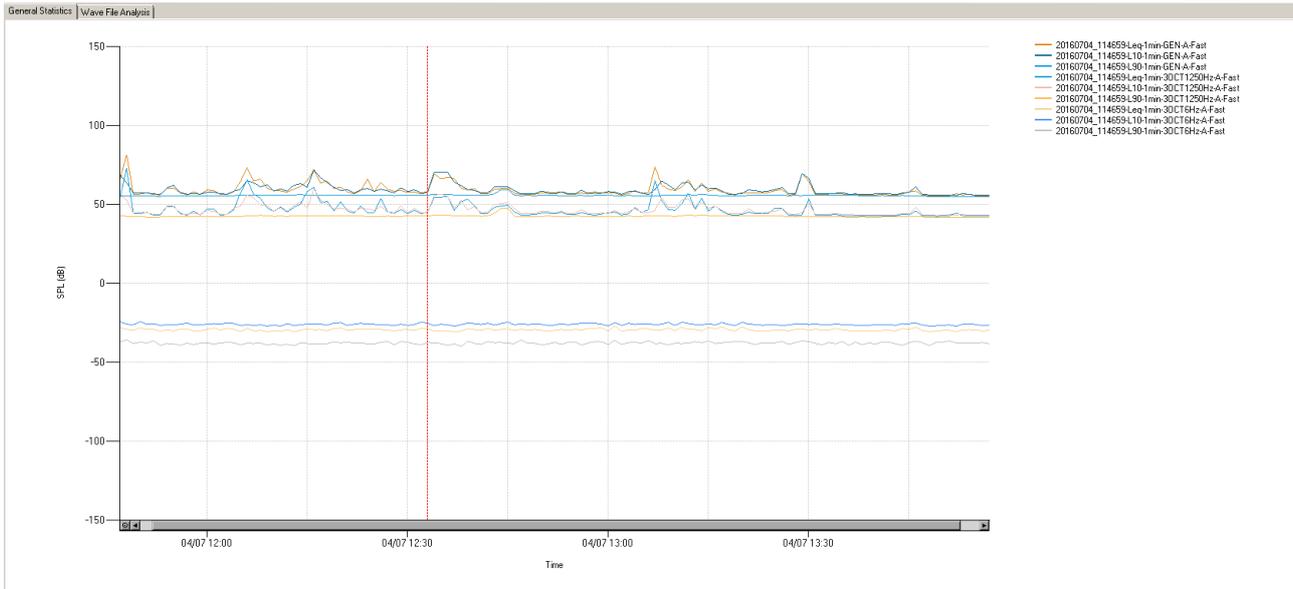


Figure 2: General Statistics View

2.3 Wave File Analysis Tab

The wave file analysis tab allows a user to play the recorded audio starting at a particular point of interest, such that the exact cause of a disturbance can be determined.

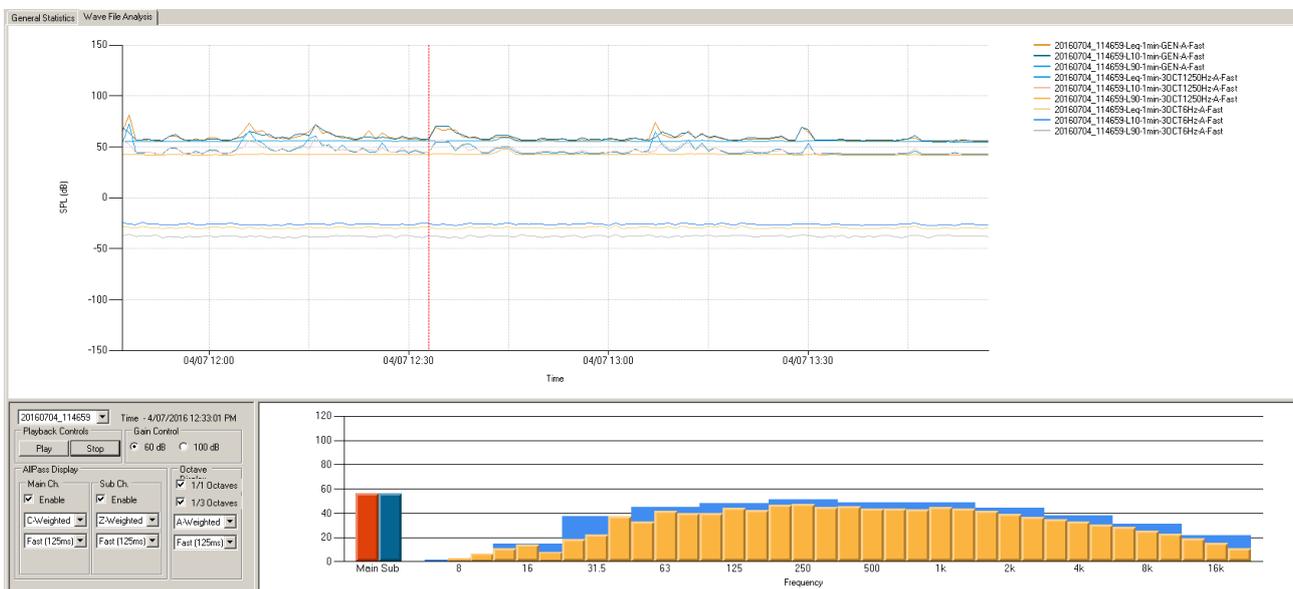


Figure 3: PCM Playback View

2.4 Log Display Window

The log display window alerts the user to the status of FireFly for the current program usage. It is located at the bottom of the main screen and is always visible.

When statistics are generated the progress of statistics generation is displayed in this window.

2.5 Status Bar

The status bar which runs along the bottom of the main program window will indicate all long running process progress, with the ability to cancel each as required.

This status bar will also indicate the presence of a valid hardware license key. See Section 8.2 for details of key operation.

3 Session Handling

3.1 Loading

A Ngara session can be loaded a number of different ways. These include;

- Inserting a Ngara session USB device
A Ngara formatted USB storage device will be automatically detected upon recognition by the application. While FireFly is running, simply insert a USB device to the computer and FireFly will automatically load all sessions it finds.
- Drag and Drop
Dragging a Ngara session folder into the session list window will force FireFly to load the contents of that session.
- Manual Selection
Sessions may also be loaded by selecting `File -> Open Session` and manually navigating to the session folder.

3.2 Closing

Sessions can be closed by right clicking on the session name. Or by selecting `File -> Close Session`.

This removes the session from the available list, but does **not** remove any of the processed data points.

4 Data Processing

FireFly is capable of generating statistics using pre-recorded Ngara session data. The processed data is then displayed on charts to easily find disturbances or regions of interest.

All statistics data is stored to the hard drive in textual Comma-Separated-Variable (CSV) files. The location of these stored files can be updated as required.

4.1 Configuration

A new statistics process is created by right clicking on a session name and selecting **Do Stats**. A configuration window will be displayed, showing the statistical data can be generated.

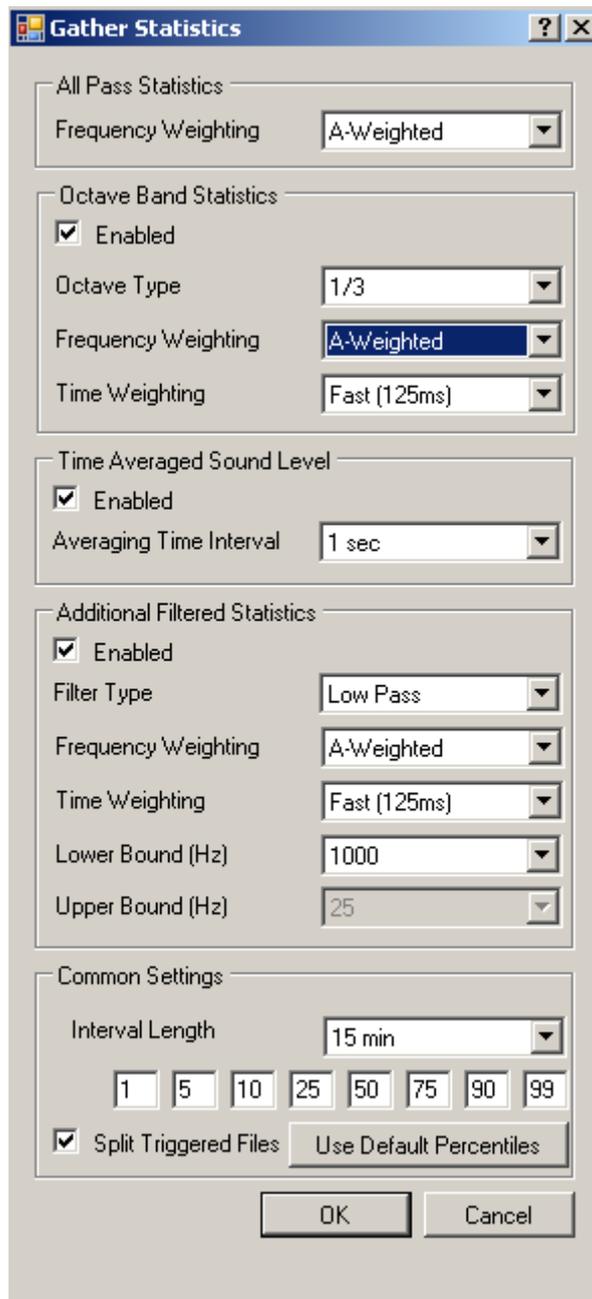


Figure 4: Statistics Configuration

Having chosen the required settings for the statistics desired, selecting **Ok** will start processing the raw data.

Once finished, the created statistics will be available for viewing and will be displayed within the session list window. The following sections describe each configuration option in some detail.



Due to the intense computation required, it may take some time for FireFly to process large sessions if Octave Band Statistics are selected.

4.1.1 All Pass Statistics

This group controls the outputs which will be generated based solely on the CSV data read from the imported Ngara session.

As this data is already time weighted, the only available selection is for frequency weighting.

4.1.2 Octave Band Statistics

This group controls the outputs which will be generated based solely on the PCM data read from the imported Ngara session.

As this data is not processed in any way, all possible sign processing criteria is available.

4.1.3 Time Averaged Sound Level

This group controls the short term L_{eq} files which are to be generated. The time averaged (L_{eq}) sound levels will be frequency weighted according to the frequency weighting settings of the all pass and octave statistics.

4.1.4 Additional Filtered Statistics

This group controls the outputs which will be generated based solely on the PCM data read from the imported Ngara session.

As this data is not processed in any way, all possible sign processing criteria is available.

4.1.5 Common Settings

This group controls common statistics configuration that will be used for all modules.

When the option *Split Triggered Files* is turned off, it will ensure that all triggered PCM files result in a single statistics point at the **end** of the file. When turned on, the file will be split into chunks corresponding to the *Interval Length* selected.

4.2 Data Storage

All created statistics are stored to the `Firefly_Data` folder to a user settable location.

The `File` menu provides functionality to view or change current data storage location.

To view the existing data location, select the `Open Current Data Location` option which will open an explorer window to the current data location.

To change the data location, select the **Change Data Save Location** option and select a new path for the data to be saved into.



Care must be taken when changing the storage location as all existing results files are not moved.

5 Chart Controls

The General Statistics Tab permits users to view session data in a chart and perform operations on this chart to enable detailed analysis. A key to the right of the chart allows each line on the chart to be identified.

5.1 Zoom

FireFly provides a facility for zooming in on regions of interest. This can be achieved by highlighting a section by dragging the left mouse button.

This action allows the data to be analysed in greater detail. By clicking the button circled in red, the chart will cycle through each previous view, until returning to the initial view.

5.2 Daily Views

The Daily View is a series of charts, each representing a single day of data from the session. This view is created in a new tab, from which it is possible to configure and export charts for each day of a Ngara logging session for use in a report or for correspondence.

5.2.1 Creating

A daily view can be created by right clicking on the chart area in the General Statistics tab. The daily view will be created using the statistical options currently selected on the main screen in the Percentile Window and Session List.

Creating a daily view allows each day of data to be analysed separately. The daily view will be created under a new tab labelled Detailed Statistics.

Left clicking on a chart will bring it to full size and another left click will go back to the previous view.

5.2.2 Configuring

The Daily View charts can be configured to suit the user via a right click. By right clicking on the daily view tab, the details of the plot may be changed, including axis scaling and headings. The whole series of charts can be configured together (excluding chart headings) or a single day can be configured.

Selecting **Configure Chart(s)** will result in the plot configuration screen, which allows a user to select a number of options including:

- X and Y axis scaling
- Chart title



Chart Title is only available when configuring a single chart.

5.2.3 Exporting

The Daily View charts may be exported to a number of image formats, including:

- JPEG
- GIF
- EMF
- BMP
- TIFF

This enables these images to be utilised when communicating results.

Right clicking on the **Detailed Statistics** tab enables a number of export options. A window will appear allowing a location to be selected.



An image file for each day of the session will be created, regardless of which view this operation is performed on.

5.3 Frequency Views

If Octave Band statistics have been collected, it is possible for frequency plots to be created.

5.3.1 Creating

In order to create a frequency plot, the view must be zoomed on the main chart to include a maximum of 24 hours worth of data. Right clicking then allows **Create Frequency View** to be selected.

5.3.2 Configuring

The Frequency View charts can be configured to suit the user via a right click. By right clicking on the frequency view tab, the details of the plot may be changed, including axis scaling and headings. The whole series of charts can be configured together (excluding chart headings) or a single day can be configured.

Selecting “**Configure Chart(s)**” will result in the plot configuration screen, which allows a user to select a number of options including:

- X and Y axis scaling
- Chart title



Chart Title is only available when configuring a single chart.

5.3.3 Exporting

The Frequency View charts may be exported to a number of image formats, including:

- JPEG
- GIF
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- TIFF

This enables these images to be utilised when communicating results.

Right clicking on the “Detailed Statistics” tab enables a number of export options. A window will appear allowing a location to be selected.



An image file for each day of the session will be created, regardless of which view this operation is performed on.

5.4 Palette Selection

Predefined colour palettes can be cycled by right clicking on the chart and selecting cycle colour palette.

5.5 Export Tabular Values

Selected statistical values can be exported to an Excel file by right clicking the main chart and selecting Export Tabular Values. This will open the Output Setup window, which allows particular settings to be chosen from the existing statistics, including:

- Session
- Statistical interval
- All Pass Frequency Weighting
- Octave Band statistics (1/1 or 1/3) and frequency weighting
- Statistics types to export (L_{eq} , Percentiles, etc.)

Pressing OK will cause a Save dialog to open for the user to select a name and location for the file to export to.

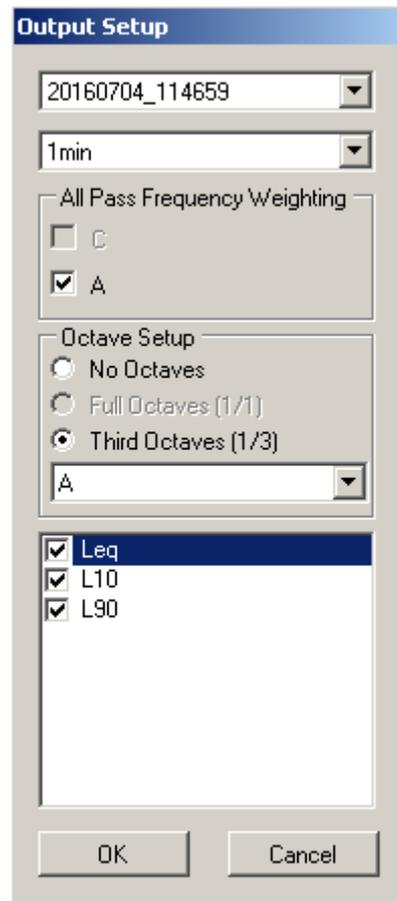


Figure 5: Tabular Values Configuration

6 Audio File Analysis

FireFly provides the facility to play back the audio (PCM) files recorded by Ngara at a time selected by a user. This allows the cause of a disturbance to be identified and studied.



Ngara must have been set up to record wave files at a sampling rate of 48kHz for this to apply.

6.1 The Chart Window

The Chart Window displays data as in the General Statistics tab.

From this chart, disturbances and other regions of interest can easily be identified. The time for which the audio recording is to be played must be selected on this chart with a left click and is identified by a vertical red line. By default, FireFly will begin playing at the beginning of a session if no time is selected.

6.2 The Octave Plot

6.2.1 Overview

The Octave Plot displays octave bands as the recording is playing. It also displays the All Pass SPL at the left of the window with a red bar. The blue bar permits a second All Pass SPL to be displayed, with different settings. These can be selected through the Parameter Box.

The blue bars on the octave plot represent the 1/1 Octave results, whilst the yellow bars represent the 1/3 Octave results. Octave band statistics do not need to have been obtained via Do Stats in order for these to be displayed as these are calculated in *real-time*.

6.2.2 Zooming the Octave Plot

By default, the plot will be displayed with a full range of 0 – 120dB. Left clicking on the Y-axis of the plot enables the plot to be enhanced.

6.2.3 Displaying SPL

Left clicking on any frequency band allows the exact SPL to be displayed by FireFly for the selected band.

6.3 The Parameter Box

6.3.1 Overview

The parameter box permits the conditions to be selected under which the wave recording is to be analyse. It also displays the exact date and time of the recording, enables the session to be selected, and provides buttons for playing and pausing of the file.

6.3.2 Playing audio

In order to play audio through FireFly, a session must be selected via the drop down menu provided.

After doing this, the time of interest should be selected on the chart with a left click, as illustrated in The Chart Window. Options should then be selected as required, and as described in All Pass Display Options and Octave Display Options. After selecting the options required, click “Play”.

The audio can be paused by selecting “Stop”. This will pause the octave display and enable values to be read from the plot, and an exact time read from the options panel.

6.3.3 All Pass Display Options

There are two channels for the display of all pass values available. These can be toggled on and off via the All Pass Display options. A number of different frequency weightings are available, including:

- Z-Weighted
- A-Weighted
- C-Weighted

Time weighting is also available as:

- L_{eq}
- Fast
- Slow

6.3.4 Octave Display Options

Playback of .wav audio enables a display of octave SPLs. Via the Octave Display options, it is possible to select:

- 1/1 Octaves
- 1/3 Octaves

A number of different frequency weightings are available, including

- Z-Weighted
- A-Weighted
- C-Weighted

Time weighting is also available as:

- L_{eq}
- Fast
- Slow

7 Weather Data

FireFly has the ability to import and plot text based weather data.

The weather data can be plotted as a function of time, as well as imported into session charts so areas affected by adverse weather conditions can be highlighted.

7.1 Adding Weather Data

The weather toolbar is used to add time series weather data.

As the data can come in many different formats, the user is given the option to arrange the read data using a separate window. Initially the Import Weather window is blank until the user imports a file. This is achieved through the Load button.

All weather files are assumed to be in some form of delimited textual format. The delimiting character can be updated, along with the option of including header rows from the file by checking the Header Row checkbox.

If no header rows are included, the user **MUST** rename columns.

Firefly needs the following columns (only one of each) to determine what kind of data is found:

- Date
- Time
- Wind
- Temperature
- Rain



The column colours will update once a keyword is detected.

Automatic detection of keywords from header rows is possible, however, it is up to the user to ensure only **ONE** (1) of each column colour is processed. (Date and Time values can be spread over two columns)

Extra columns can be deleted by selecting the entire column and clicking on delete.

7.2 Attaching Weather Data

When a valid overlapping session is found, the user is given the option to attach the weather sections that could be marked as being adversely affected.



The time series weather data will not be displayed on daily or frequency views.

To mark out areas of interest on the chart, the user needs to attach weather information to a session using the attach toolbar button (the same weather time series can be used for multiple sessions)

This will generate a set of markers in the following colours -

- Green
Wind affected

- Red
Temperature affected
- Blue
Rain affected

8 Licensing

Software licensing is provided through a USB license key. This key is provided to ensure that all copies of the software are traceable to Acoustic Research Lab Pty Ltd.

8.1 Sentinel

the Sentinel USB keys do not require any special drivers for correct operation. These now work using a standard *HID* device driver provided with a standard windows operating system.



If you are running Windows 10, please ensure you are using the newest hardware key available from Acoustic Research Labs Pty Ltd.

8.2 Hardware Key

This hardware license key provides the ability to process session data, without the key only statistics which have already been processed can be viewed.

Colour	Status	Description
Green	Valid Key Found	New statistics can be generated
Red	No Key Found	Old statistics can be loaded only

9 Application Change Log

Revision History

Revision	Date	Author(s)	Description
v2.1	2013-01-30	michelle.youssef	Short term Leqs, log display bar, command line hidden, bug fixes
v2.1.1	2014-04-28	Juan Aguero	as per web page
v2.2	2014-12-19	Juan Aguero	V2.2 Release
v2.3	2016-05-06	Corey Stewart	Fixed short term Leq issue
v2.4	2016-11-03	Corey Stewart	Added support for old sentinel HASP hardware keys and newer sentinel LDK keys.
v2.5	2017-04-11	Juan Aguero	Updated with new installer and dongle library
v2.6-rc1	2018-05-29	Juan Aguero	Fix applied to Leq calcs
v2.6	2018-06-01	Juan Aguero	Leq fix
v2.7-rc1	2018-06-05	Juan Aguero	Updates to fix command line to GUI communications
v2.7-rc2	2018-06-12	Juan Aguero	Fix logical processor counting
v2.7-rc3	2018-06-15	Juan Aguero	Released with spl mem leak fix
v2.7-rc4	2018-06-21	Juan Aguero	Win10 audio fix
v2.7	2018-07-16	Juan Aguero	Fixed Win10 incompatibilities
v2.8	2020-03-19	Juan Aguero	Update to remove old hardware keys and fix 200Hz octave band
v2.9	2020-09-17	Juan Aguero	Update samples used for interval calculation