Mezzo Precision Microphone

with Mezzo Noise Analyzer Module

User Guide – v2.2

2023-01-27

Soft dB Inc.
1040, Belvedere Avenue, Suite 215
Quebec (Quebec) Canada G1S 3G3
Toll free: 1-866-686-0993 (USA and Canada)
E-mail: info@softdb.com

Soft dB
WWW.SOFTDB.COM

Contents

1 Introduction

Congratulations on your purchase of the Mezzo Precision Microphone. This instrument provides an innovative and cost effective solution for professional grade acoustical measurement. More than just a DAQ, the DSP embedded in each Mezzo Precision Microphone ensures real-time signal processing. Moreover, the Mezzo uses a proprietary driver ensuring signal integrity.

Designed to be used with a tablet PC or any other Windows-based PC, the Mezzo Precision Microphone takes profit of the versatility and flexibility provided by computers. This approach also allows offering the Mezzo Precision Microphone along with a measurement module from the Mezzo Software Suite at a very competitive price. Used along with the Mezzo Noise Analyzer measurement module, the Mezzo Precision Microphone complies with IEC 61672 (2013) Class 1 standard.

The Mezzo Precision Microphone is compatible with the following modules of the Mezzo Software Suite:

- **Noise Analyzer**: SLM, RTA, FFT & advanced post analysis.
- **Noise Monitor**: SLM, RTA, FFT & advanced monitoring functionalities.
- **Building Acoustics**: room noise, reverberation time, airborne sound insulation, impact sound level & more.
- **Waveform Recorder**: signal recording & advanced post-processing tools.

The current user's manual describes the Mezzo Noise Analyzer module. While focusing on the Mezzo Precision Microphone hardware, the other members of the Mezzo hardware family can also be used (Intensity Probe, 2 ch Analyzer, 4ch Analyzer).

2 Hardware Description

The full measurement system mainly consists of a host computer that is connected to the Mezzo Precision Microphone through USB cable. The computer is the responsibility of the owner since Soft dB does not sell it. Section 2.1 describes the requirements that should give guidelines in its selection.

2.1 Computer Requirements

Computer Requirements

Item	Minimum Requirements
Operating System	Windows 7 sp1, Windows 8.1, Windows 10
CPU	Dual-Core at 1.2 GHz[1]
Memory	2 GB RAM
Hard drive	300 MB free hard disk space
Port	USB 2.0
Display resolution	800 x 600

2.2 Mezzo Precision Microphone Specifications

Mezzo Precision Microphone Specifications

Item	Specifications
Microphone	BSWA MPA221 (Class 1)[2] or BSWA MPA225 (Class 2)[3]
Connector	SMB
Peak Maximum Level[4]	Low Range: 112 dB_{pk} High Range: 126 dB_{pk}
Noise Level[5]	Low Range: 22 dBA, 20 dBC, 25 dBZ High Range: 32 dBA, 30 dBC, 35 dBZ
Under-Range Limit Level[6]	Low Range: 32 dBA, 30 dBC, 35 dBZ High Range: 39 dBA, 37 dBC, 42 dBZ
Input Range	Low Range: 0.42 V_{pk} High Range: 2.1 V_{pk}
Maximum Sampling Rate	48 kHz
Signal Conditioning	IEPE
Communication	USB 2.0 (Mini B connector)
Dimensions	230 x 32 x 23 mm
Power Supply	USB Powered (Max 0.35W)

[1] If using the 1/24 octave spectrum, the CPU requirement is Dual-Core at 2.4 GHz.

[2] ½" MP201 Mic with MA221 Preamp – 50 mV/Pa, IEC 61672 (2002) Class 1, SMB Connector.

[3] ½" MP215 Mic with MA221 Preamp – 40 mV/Pa, IEC 61672 (2002) Class 2, SMB Connector.

[4,5,6] Evaluated according to IEC 61672 (2013) Class 1, using 50 mV/Pa sensitivity.

2.3 Accessories

Included Accessories

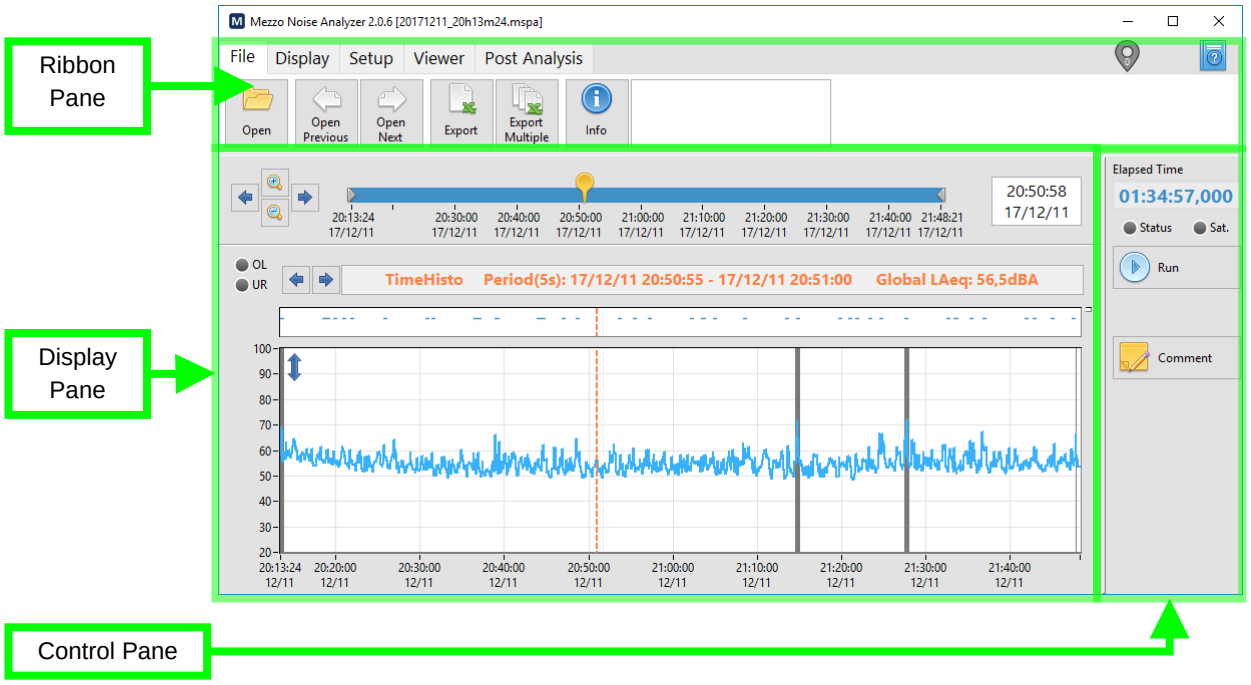
Component	Description
Mezzo Unit	The Mezzo Precision Microphone without the actual microphone. Dimension (with microphone): 228x31x22mm (9x1.22x0.86”)
ICP Microphone	BSWA MPA221: ½” MP201 Mic with MA221 Preamp – 50 mV/Pa, IEC 61672 (2002) Class 1 or BSWA MPA225: ½” MP215 Mic with MA221 Preamp – 40 mV/Pa, IEC 61672 (2002) Class 2
USB Cable	1 m USB 2.0 cable with Mini B connector
Windscreen	50 mm diameter windscreen
Case	Plastic transport case Dimension: 268x240x57mm (10.5x9.5x2.25”)

Optional Accessories

Component	Description
Extension Adapter	Plugs a wire into the Mezzo unit in order to deport the microphone.

3 Mezzo Noise Analyzer Measurement Module

The Mezzo Noise Analyzer measurement module is part of the Mezzo Software Suite and is included with the Mezzo Precision Microphone. It offers a professional sound level meter with a real-time spectrum analyzer and advanced post analysis functionalities.



Main interface of the Noise Analyzer Module

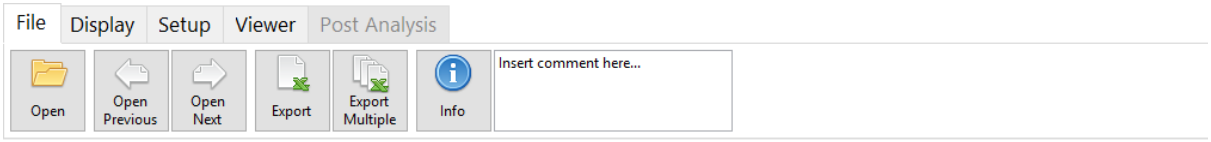
General Module Specifications

Parameter	Value
Available Data	Time weighting: Slow, Fast or Impulse. Frequency weighting: A, C and Z. Global levels, octave spectrum (1/1, 1/3, 1/24) and FFT spectrum. Live data: SPL, Peak, live Leq. Periodic Average and Overall Average data: SPL Stats (Lmin, Lmax and selected LN%), Peak max, Leq. Taktmax.
Bandwidth	1/1 octave: 16 Hz to 16 kHz 1/3 octave: 12.5 Hz to 20 kHz 1/24 octave: 11.4 Hz to 22.1 kHz FFT: 0 to 22 kHz
Events	Up to 4 independent events. Periodically or on trigger. An event can include: • Audio record (wav or mp3) • Pictures from the camera (if any) • The main average noise during the event
Data save	Levels data and audio events are added to the measurement file as they become available

	during the measurement. Three save modes are available: • Single Period: Save the overall average data at the end of the measurement. It is simple and creates small files but it does not allow any post analysis (post periods and masks). • Multiple Periods: saves the raw periodic average data at each period end. The time resolution in post analysis directly depends of the selected Average Duration and it produces files with reasonable sizes. • Instant Data: saves the raw instant data (live) at the instant rate. It allows the best time resolution in post analysis but the files are heavier.
Display	All measured data (both live and overall) can be displayed during the acquisition. In post analysis, the available data depends on the record mode. The main panel is scalable (smaller is 680 x 480 pixels)
Post Analysis	Available on files that used the Multiple Periods or Instant Data as record mode. Evaluation of the average level on post intervals from the raw data (either instant data or periodic average). The bounds of the post intervals can be set manually or automatically. Masks can also be applied to filter unwanted events. Possibility to use several scenarios of different intervals and masks.
Miscellaneous	Export the overall data to Excel. Automatically reconnect and restart a measurement if an error occurs.

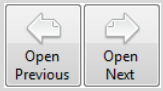
3.1 Ribbon Pane

3.1.1 File Menu

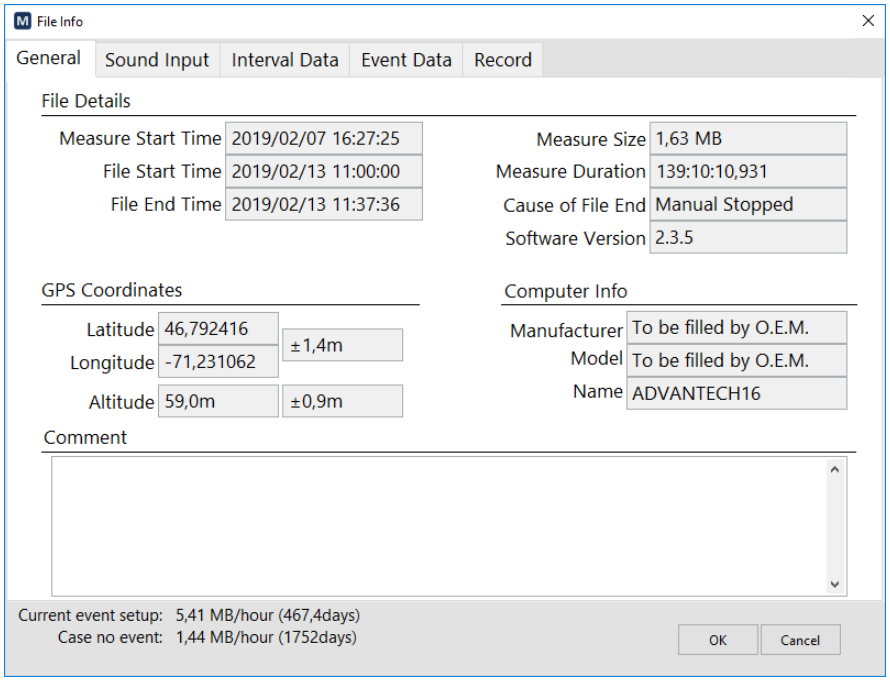


File Menu

File Menu

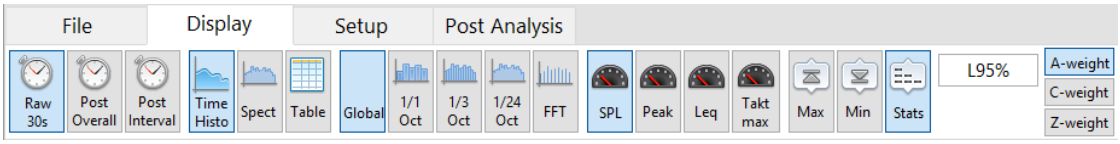
Icon	Description
	The Open button prompts the user to open data files (.mspa). Several files can be loaded all at once given that they are part of the same measurement.
	These two buttons open the previous/next data file in the Record Directory.
	This button exports the loaded data into a tab delimited file (.txt). The Export interface sets the data to be exported. The exported file can be easily opened with any spreadsheet application such as Microsoft Excel.
	This button prompts the user to select several files to be exported in a batch process. The same Export interface also sets the data to be exported according to the setup of the first selected file. Each source file is exported into its own export file.

	This button opens the File Info interface (figure below). It contains the information on the measurement over several tabs: • General information (including Comment) • Sound Input setup • Interval Data setup • Event Data setup • Record Setup They are all indicators except for the comment, which can be modified either while measuring or once the measurement is completed. In the bottom left of the panel, the record rate and the remaining record duration are estimated.



File Info Interface

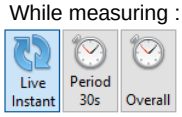
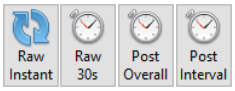
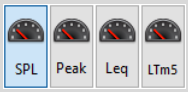
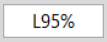
3.1.2 Display Menu



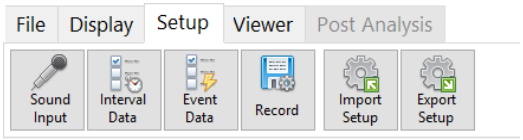
Display Menu

Display Menu

Icon	Description

While measuring :  Post Analysis : 	The Live mode displays the current level during the measurement (Live SPL, Leq or Peak). The Overall mode displays the overall level (SPL Max, Min and LN%, Leq or Peak Max). While acquiring the display can be toggled between Live and Overall mode. In post analysis, the instant data is only available if the instant record mode was used. Also, The Post Interval mode displays the effect of the bounds and masks added in the post analysis tab.
	Toggles between the SPL, Peak, Leq or Taktmax data. If the Data Setup is set to FFT, only the Leq button is available.
	Toggles between the SPL Max, Min or Stat data. These controls are only available when displaying the SPL data type in Average mode (periodic or overall).
	Sets the statistic to be displayed when the Overall SPL Stats data are selected.
	Selects the applied frequency weighting: A, C or Z (no weighting). The A-weighting is the most common. The three weightings are evaluated in parallel in the time domain except for the spectrum, for which the dBA and dBC are obtained by applying the frequency weighting on dBZ spectrum.
	Sets the frequency of the selected spectrum (octave or FFT) to be displayed in the time history graph. For an octave spectrum, the left/right arrows can be used to shift to the next band.

3.1.3 Setup Menu

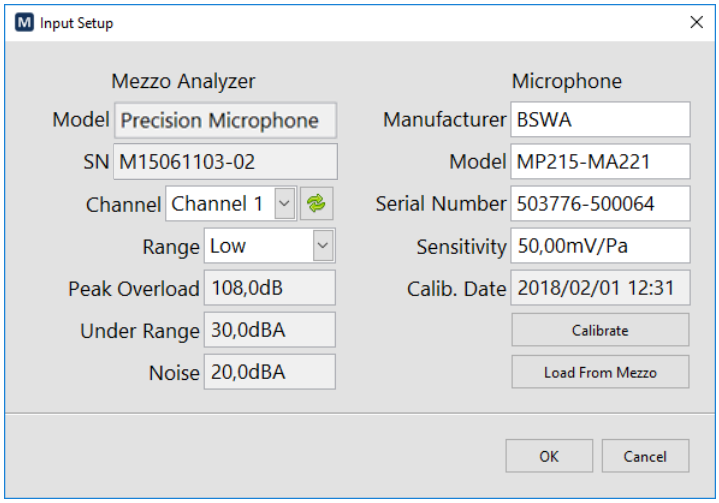


Setup Menu

Setup Menu

Icon	Description
	The Sound Input button calls the Sound Input Setup interface (page 7). It mainly sets the sensitivity and range of the sensor.
	The Data button calls the Interval Data Setup interface (page 8). It mainly sets the interval data to be evaluated and recorded.
	The Event Data button calls the Event Data Setup interface (page 10). It mainly sets when to record an event and what it will contain (audio, pictures, average).
	The Record button calls the Record Setup interface (page 10). It mainly sets the record destination and the file management.
	The Import Setup button prompts the user to load a measurement setup from a file. The source file can be previously exported configuration (.cfg) or measurement file (.mspa).
	The Export Setup button prompts the user to save the current measurement setup into a file (.cfg).

Sound Input Setup



Input Setup interface

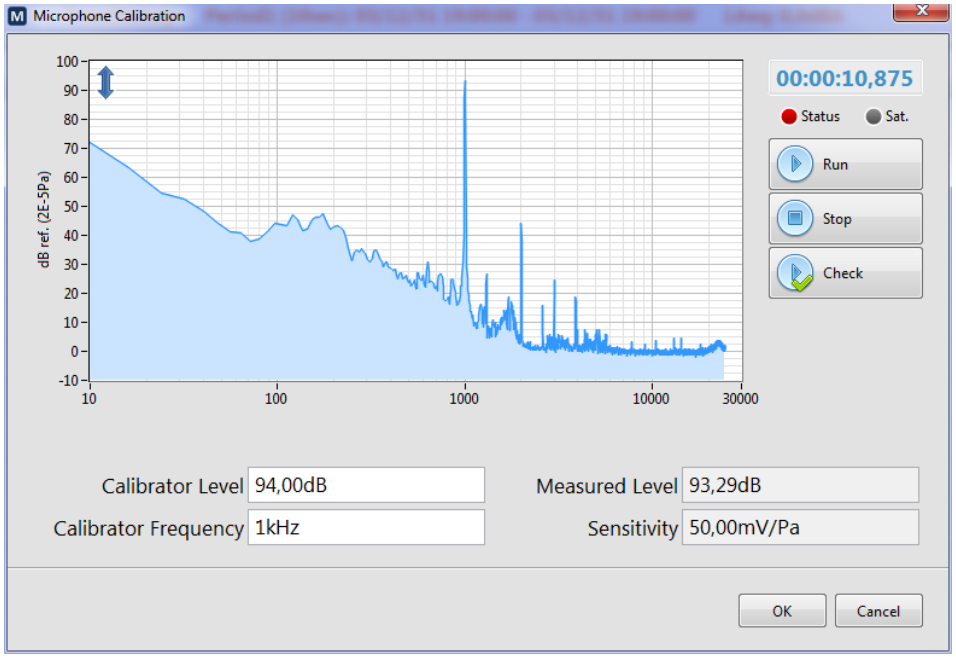
The left part of the Input Setup interface is related to the Mezzo Analyzer (without the sensor) and the right part is related to the microphone.

Sound Input Setup Interface

Control / Indicator	Description
Model Precision Microphone	Model of the detected hardware.
SN M15061103-02	Serial Number of the detected hardware.
Channel Channel 1	Selects the input channel to be measured if several channels are available on the detected hardware. The Mezzo Precision Microphone is single channel.
Range Low	Selects the Low or High input range to be used during the measurement.
	This button resets the Mezzo input without unplugging it. Can be useful to retake control of a corrupted inputs that shows an abnormal behaviour.
Peak Overload 110,0dB Under Range 32,0dBA Noise 22,0dBA	The indicators show the operating amplitude range. Those values change according to the sensitivity and the selected gain.
Manufacturer BSWA Model MP215-MA221 Serial Number 503776-500064	The Manufacturer, Model and Serial Number of the microphone
Sensitivity 50,00mV/Pa Calib. Date 2015/12/01 10:53 Calibrate	Sets the Sensitivity of the microphone. To set the sensitivity, a level calibration is usually done using the Microphone Calibration interface. It can also be set by manually overwriting the Sensitivity field.
Load From Mezzo	Loads the microphone information from the Mezzo memory (factory defined)

Microphone Calibration Interface

The microphone can be calibrated using the Microphone Calibration interface and a sound pressure calibrator.

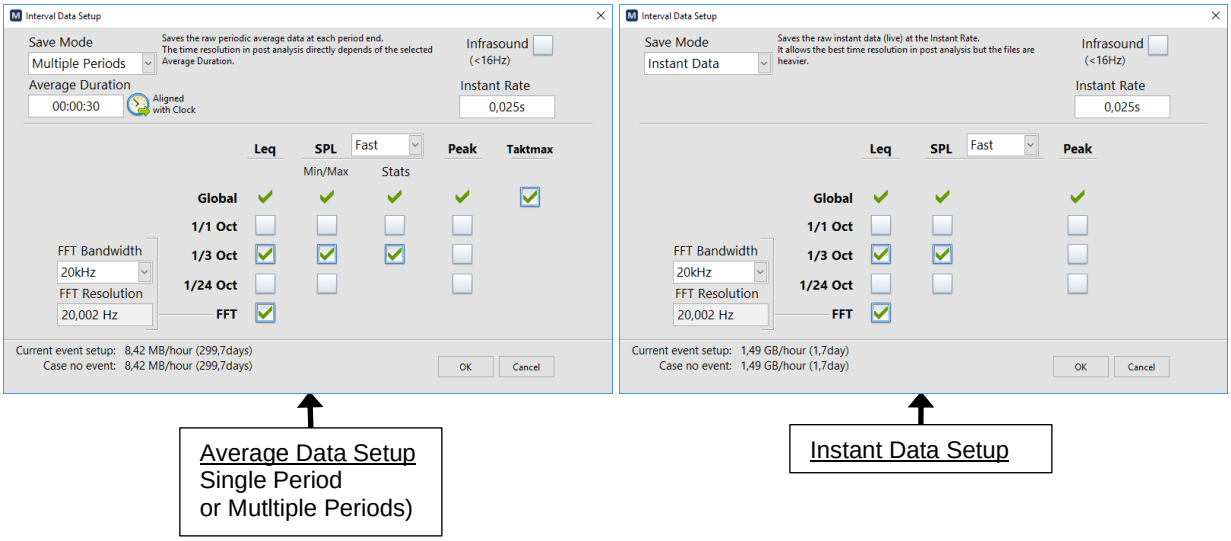


Microphone Calibration interface

1) Adjust the Calibrator Level and Calibrator Frequency according the sound calibrator used. Most calibrators generate 94 dB at 1 kHz.
2) Install the sound calibrator on the microphone and start the calibration signal.
3) Press Run to start the calibration measurement.
4) Wait a few seconds until the measured level stabilizes. 10 seconds should be enough.
5) Press Stop. The sensitivity is updated according to the calibration measurement.
6) If the new Sensitivity value is acceptable, press OK

Also, the Check button allows to run a calibration measurement using the current sensitivity but without automatically updating it.

Interval Data Setup



Average Data Setup
Single Period
or Mutltiple Periods)

Instant Data Setup

Data Setup interface

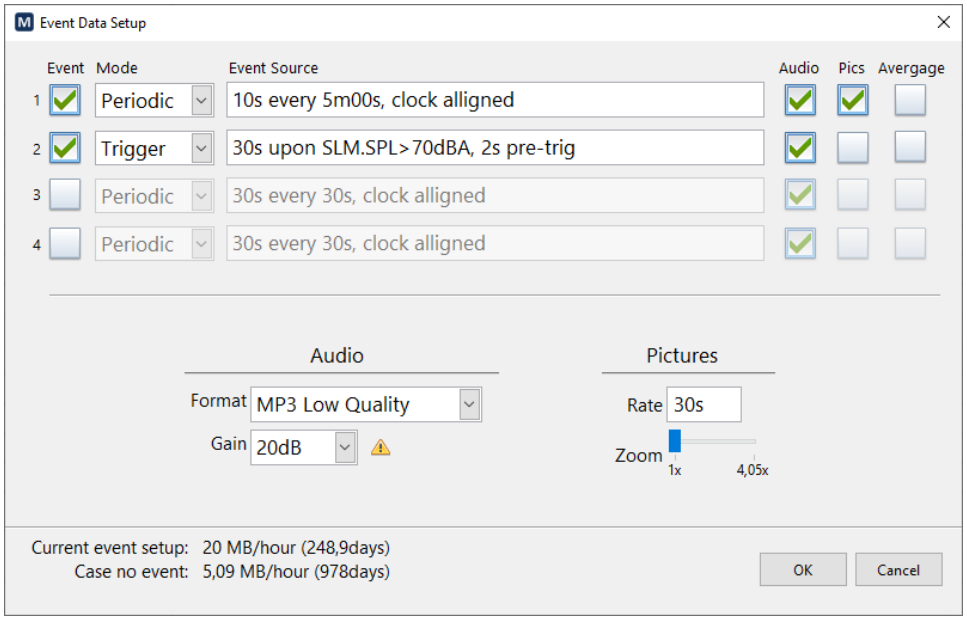
The Data Setup varies slightly according to the Record Mode used in the Record Setup.

Data Setup interface

Control / Indicator	Description
Save Mode Multiple Periods Single Period Multiple Periods Instant Data	Selects the save mode: • Single Period: only saves the measurement overall average at the end of the measurement • Multiple Periods: saves several average periods (Average Duration) as each period ends. • Instant Data: saves the instant data at each sample time (Instant Rate).
Average Duration 00:00:30 Aligned with Clock	The Duration field indicates the period duration. The Align button allows aligning the periods with the clock. If set to False, the periods will be aligned with the starting time.
Instant Rate 0,025s	In Instant Data record mode, the Instant Rate directly impacts the file size of the measurement. Otherwise, it only set the reading rate of the SPL values used to evaluate the average data. The minimum and default value of 25 ms is appropriate to measure Fast (and Slow) SPL in respect of the IEC 61672(2013) requirements. However, a higher instant rate can be useful when the host PC is struggling to run the software in real-time.
SPL Fast Slow Fast Impulse	Selects the SPL time weighting that will be used during the measurement.

Global ✔ 1/1 Oct ☐ 1/3 Oct ☑ 1/24 Oct ☐ FFT ☑	The check boxes let the user selects the data to be evaluated, displayed and recorded. Some data have a check without the box to show that it cannot be disabled.
FFT Bandwidth 20kHz FFT Resolution 20,002 Hz	The FFT spectrum bandwidth is user defined: 20k, 10k, 5k, 3.33k, 2k or 1kHz. It corresponds to the frequency resolution: 20, 10, 5, 3.33, 2, and 1Hz.
Infrasound (<16Hz) ☐	The Infrasound control decides whether are not to include the energy below 16 Hz in the evaluation the global levels. It is mainly significant when no frequency weighting is applied (dBZ).

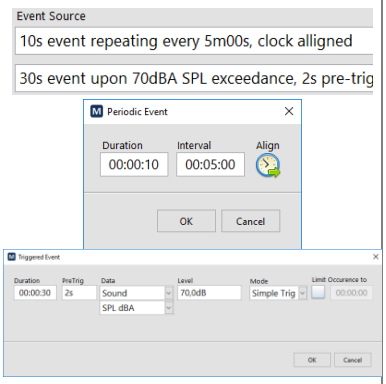
Event Data Setup



Event Data Setup Interface

Event Data Setup Controls

Control / Indicator	Description
Event 1 ☑	The Event check boxes enable up to 4 different sets of events. The events are independent and can be concurrent, so that same audio can be found on event type 1 and event type 2.
Mode Periodic	The Mode menu selects when an event type recorded. The Periodic mode starts at the defined interval for a defined duration. The Trigger mode starts when a selected data reaches the specified trigger level and stops after a defined duration.



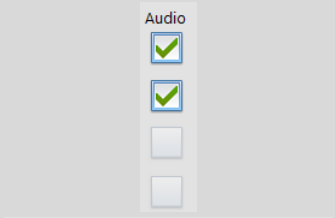
The Event Sources give the information on the event setup. Click on this control to edit.

In Periodic mode, the event duration and the interval between events can be set. If the Align button is enabled, the event will be aligned with the clock. Otherwise, it will be aligned with the measurement start time.

In Trigger mode, the event duration, pre-trig duration, the trig data source and trig level can be set.

A trig mode can be set in Simple Trig (always last for the specified duration) or in Latch Trig (duration resets every time it trigs).

It is also possible to limit the occurrence to a specific time. It avoids having too much exceedance recordings, when it's raining for instance. Enabling this feature, two events will be spaced by the limit time unless the level is higher than the previous event.



The Audio checkbox allows to include the audio signal into the event record.

The audio formats available are:

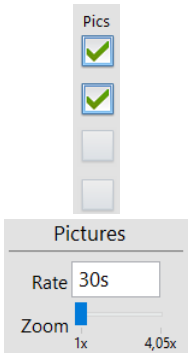
- WAV 20kHz (780 kb/s)
- WAV 10kHz (390 kb/s)
- MP3 High Quality (128 kb/s)
- MP3 Medium Quality (64 kb/s)
- MP3 Low Quality (32 kb/s)

This audio gains available are:

- 0 dB (no gain)
- 10 dB
- 20 dB
- 30 dB

Soft-clipping is applied for gains higher than 0dB.

For the purpose of identifying the noise sources, the MP3 Low Quality and the 20 dB gain are usually adequate.



The Pics checkbox allows to include picture snapshots into the event record.

The Rate control sets the frame rate in the generated video.

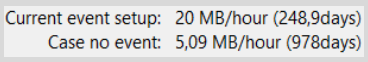
The Zoom control sets the zoom factor if it is available on the used camera.

The Average checkbox allows the average data into the event record.

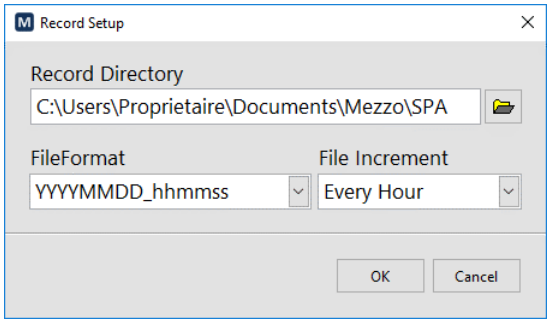
The event average data is basically an average of the audio and vibration data (if any) evaluated for the duration of the event (including pre-trig).

The audio data included are: typical global SPL stats (Lmax, L1, L5, L10, L50, L90, L95, L99, Lmin), Leq (global, 1/3oct, FFT), global Peak and Taktmax).

All the vibration data (as defined in the Interval Data Setup).

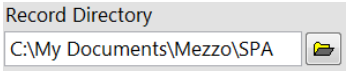
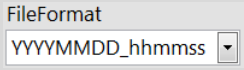
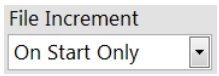
	The VibWave checkbox allows the waveforms into the event record. It includes the audio signal and 3-axis vibration signal (both acceleration and velocity). The recorded waveforms have a sampling rate of 12.2 kHz. Waveforms can be especially useful for DIN4150-3 or USBM 8507 reports.
	The information on the data size used on the record drive appears at the bottom of the interface. It states the data rate per hour and available record duration for two cases: • Current event setup: using the current event setup[5] • Case no event: if there were no event recording.

Record Setup



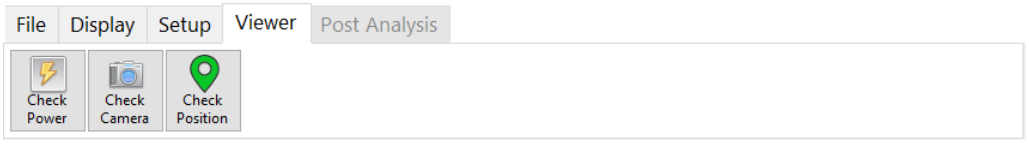
Record Setup interface

Record Setup interface

Control or Indicator	Description
	Select the directory where the measurements are saved. The default directory is *User Documents*\Mezzo\SPA.
	This list box allows selecting the file name format. Choices are: • YYYYMMDD_hhmmss • MMDD_hhmmss • DD_hhmmss • index
	This list box allows selecting the automatic file increment behaviour. Choices are: • On Start Only (no periodic file increment) • Every Hour • Every Day • Every Week No matter how the File Increment is set, a file reaching the size of 1 gigabytes (1 GB) will also be incremented. Afterwards, several files of the same measurement can be opened all at once.

[5] When trigger events are enabled, it is often impossible to determine the exact size of the recordings. Therefore, the worst case scenario is used to estimate the size information for the used event setup.

3.1.4 Viewer Menu



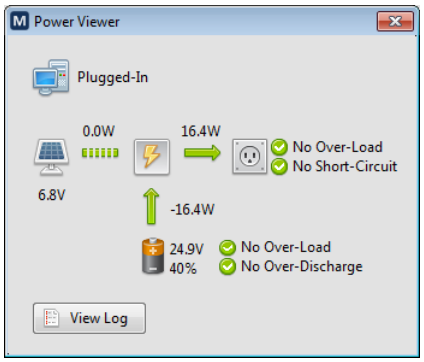
Viewer Menu tab

The current data of the optional devices can be accessed from the Viewer Menu tab.

Viewer Menu

Icon	Description
	The Check Power button calls the Power Viewer interface (page 13). It gives the power information about the PC. Given that an EpSolar Tracer solar charger is found, it also gives the power information about the solar panel, battery and load.
	The Check Camera button calls the Camera Preview interface. Whether in acquisition on not, the interface shows the image produced by the camera. The camera setup is available in the Event Data setup (page 14)
	The Check Position button calls the Position Viewer interface (page 14). Given that a supported GPS is found, it displays the current position if available.

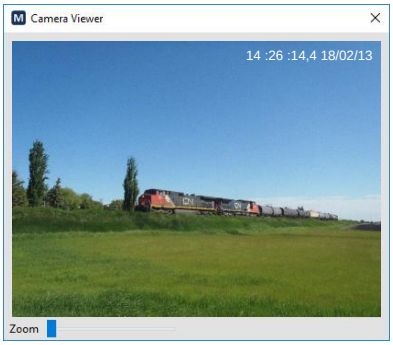
Power Viewer



Power Viewer Interface

This interface allows viewing the current power state of the monitoring station computer as well as the optional charge controller. Click on the View Log button to access the power log file.

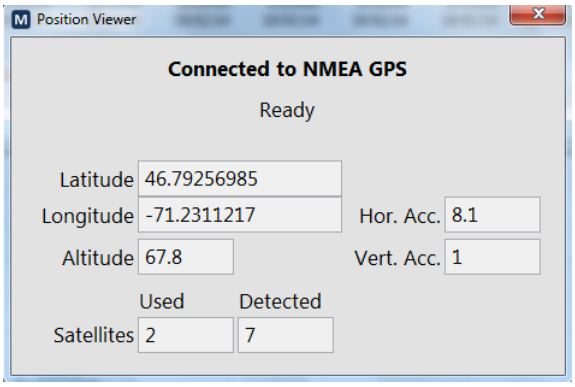
Camera Viewer



Camera Viewer interface

This interface allows viewing the video produced by the camera. Snapshots of this video can be included in the events.

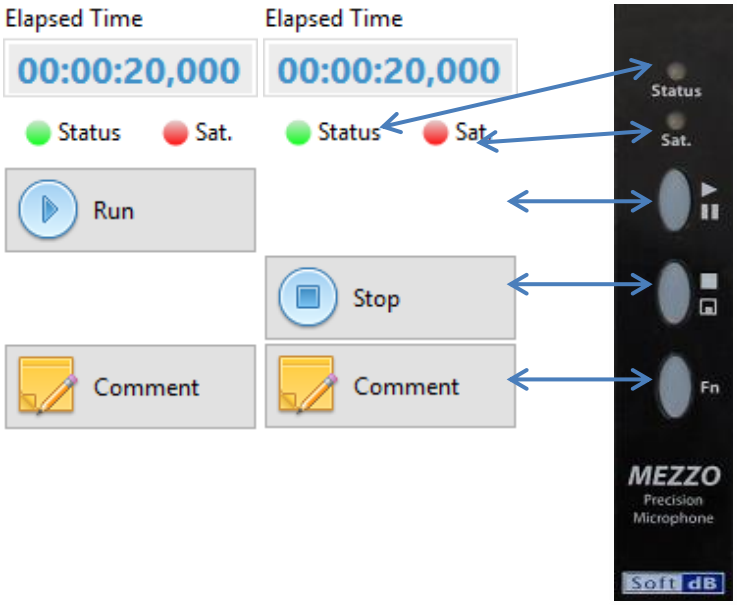
Position Viewer



Position Viewer interface

This interface allows viewing the current position if a GPS device is available.

3.2 Control Pane



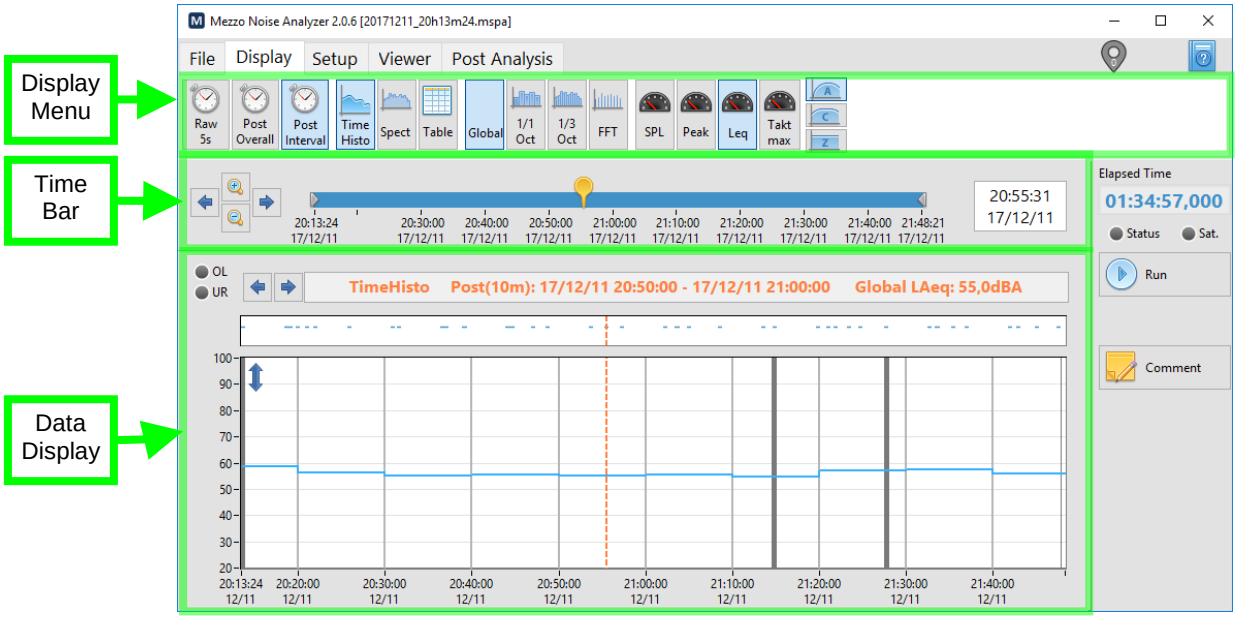
Control Pane

It should be noticed that most of the controls and indicators found in the Control Pane are duplicated on the Mezzo Precision Microphone. Therefore, the Status, Sat, Run/Pause, Stop/Save and Fn (when applicable) have the save functionalities on the probe and in the software.

Controls & Indicators

Control / Indicator	Description
00:00:20,000	The duration of the measurement in format HH:MM:SS.
Run Pause	The Run/Pause button starts or pauses the measurement. The pause is only available when the Save Mode is set in Single Period.
Stop	The Stop button stops the measurement.
Comment	The Comment button directly accesses the comment for viewing or editing. The comment is also available in the General tab of the File Info (File → Info)
Status Status Status	The Status color indicates what the acquisition state is: • Grey: acquisition off • Yellow: acquisition paused • Green: acquisition running
Sat. Sat.	The Sat color indicates if an overload occurred since the beginning of the measurement: • Grey: no overload detected • Red: overload detected

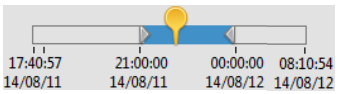
3.3 Display Pane



Display Pane

3.3.1 Time Bar

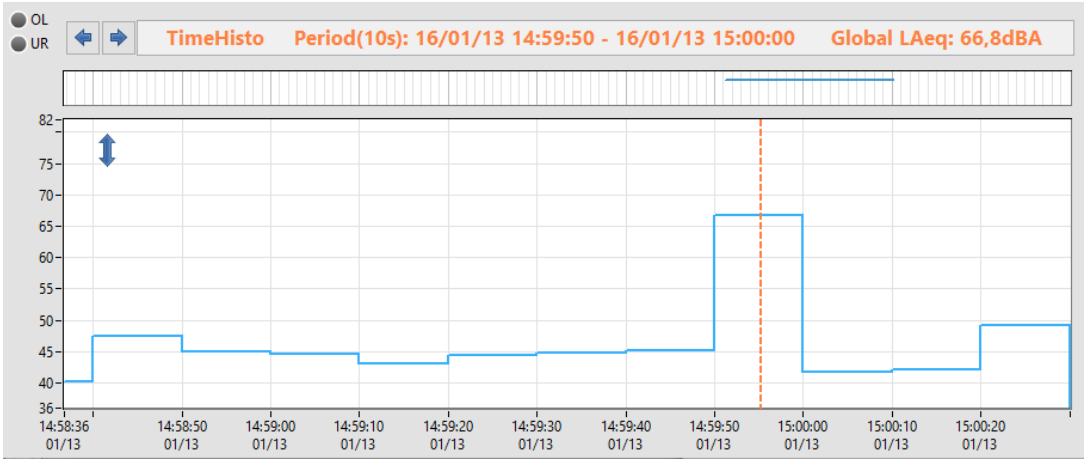
Time Bar

Control / Indicator	Description
	This time slider gives time information about the measurement and the display data. • The leftmost and rightmost values: measurement start and stop time respectively. • The grey cursors that enclose the blue span: the time span on the Time History graph. • The yellow cursor: the time cursor on the Time History graph and the time used to display a value on the Spectrum graph or Stats Table. The cursor can be moved directly from the slider control.
	The magnifier buttons zoom in and out the span of the Time History. The arrow buttons shift left or right the span of the Time History.
	This control displays the current value of the time cursor on the slider (also the cursor on the Time History graph). The exact time value should be set here.

3.3.2 Data Display

The Data Display area can display either a time history graph, a spectrum graph (1/3 octave or FFT) and a table (SPL statistics or weather).

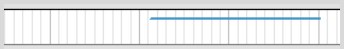
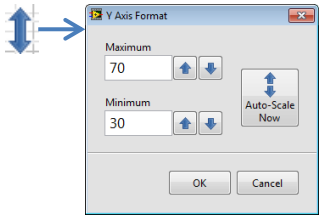
Time History Graph



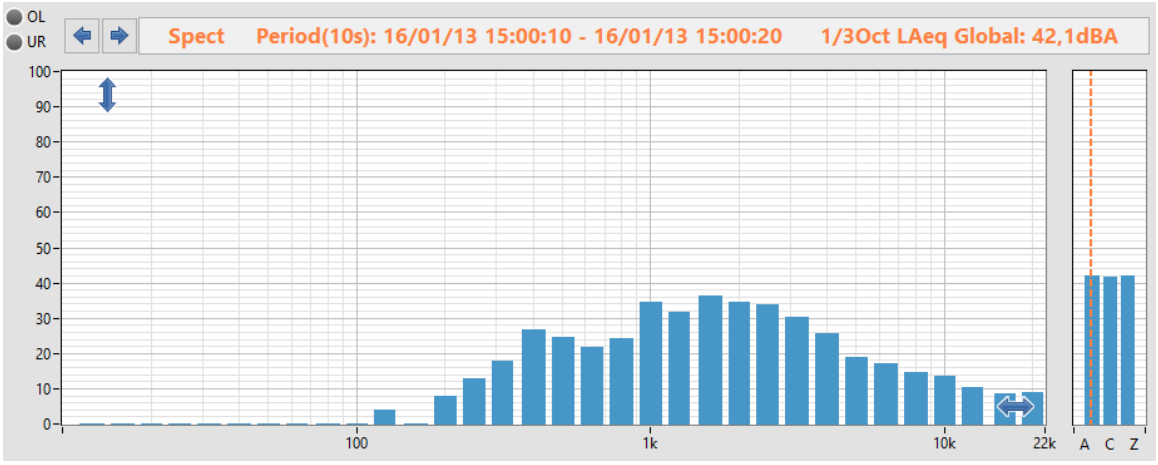
Time History Graph

The Time History displays the selected data selected in the Display Menu. The time span of the graph is set from the Time Bar.

Time History Graph

Control / Indicator	Description
TimeHisto Period(10s): 16/01/13 14:59:50 - 16/01/13 15:00:00 Global LAeq: 66,8dBA	This legend gives the main information on the data being displayed: • The display type. • The period (instant or average). • The time span of the data. • The data name and the value of the cursor on the graph.
	The arrow buttons shift left or right the cursor on the graph.
	If the OL indicator is red, it indicates that an overload occurred. During measurement, the overload stays red as soon as an overload is detected until a new average period starts. In post-process, the overload is red if an overload occurred during the displayed average data. If the UR indicator is blue, it indicates that an under range occurred. During measurement, the under range stays blue only while the under range is detected. In post-process, the under range is blue if an under range occurred during the displayed average data.
	This event graph shows when events occurred. The cursor and time span match those on the main graph below. The audio records appear as blue lines. In post process, clicking on an event opens the Event Viewer interface.
	This button opens the Y Axis Format interface from which the vertical scale of the graph can be modified. The Minimum and Maximum fields can be set manually or automatically using the Auto-Scale Now button.

Spectrum Graph



Octave Graph display (1/3 octave)

FFT Graph display

The spectrum graph displays the data selected in the Display Menu. The time of the data can be set by moving the yellow cursor in the Time Bar.

Spectrum Graph

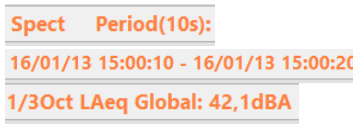
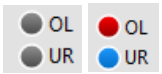
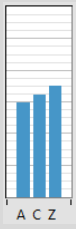
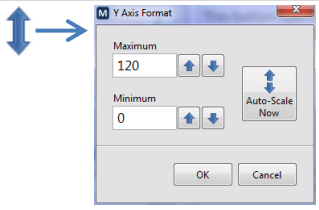
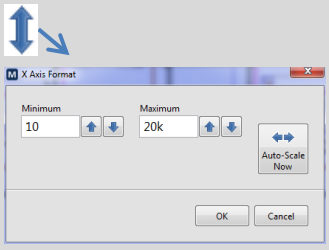
Control / Indicator	Description
	This legend gives the main information on the data being displayed: • The display type. • The period (instant or average)). • The time span of the data. • The data name and the value of the cursor on the graph.
	The arrow buttons shift left or right the cursor on the spectrum and global graphs.
	If the OL indicator is red, it indicates that an overload occurred. During measurement, the overload stays red as soon as an overload is detected until a new average period starts. In post-process, the overload is red if an overload occurred during the displayed average data. If the UR indicator is blue, it indicates that an under range occurred. During measurement, the under range stays blue only while the under range is detected. In post-process, the under range is blue if an under range occurred during the displayed average data.
	This small graph displays the global level of the requested data in the three frequency weightings (A, C and Z). This event graph shows when events occurred. The Level span matches the one on the main graph beside.
	This button opens the Y Axis Format interface from which the vertical scale of the graph can be modified. The Minimum and Maximum fields can be set manually or automatically using the Auto-Scale Now button.
	This button opens the X Axis Format interface from which the horizontal scale of the graph can be modified. The Minimum and Maximum fields can be set manually or automatically using the Auto-Scale Now button.

Table Display

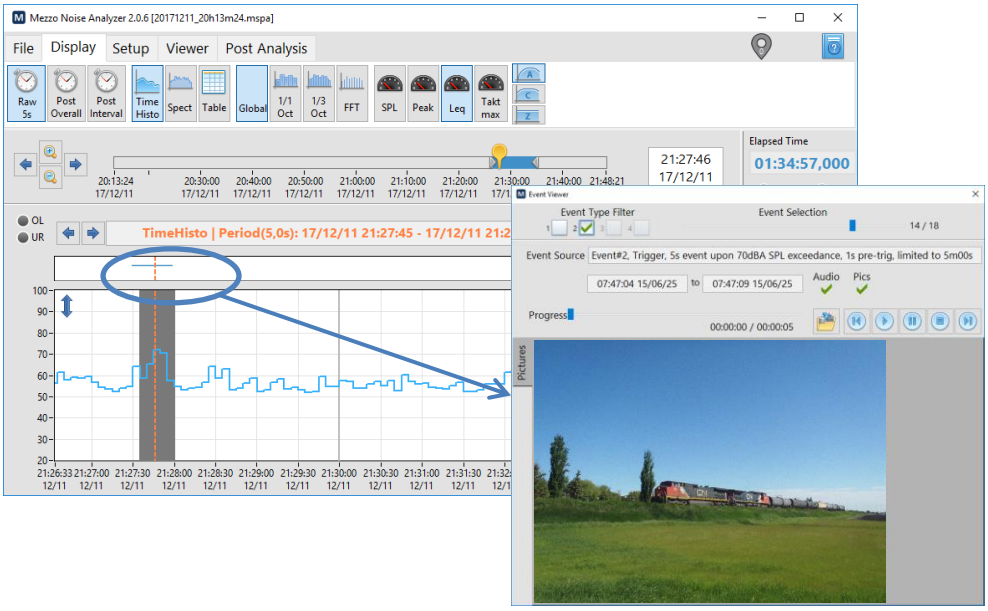
Table display – SPL Statistics

The Table display is usually used to display the SPL.

Table Graph

Control / Indicator	Description
Table Period(10s): 16/01/13 15:00:10 - 16/01/13 15:00:20 Global LAF	This legend gives the main information on the data being displayed: • The display type. • The period (average period or overall) • The time span of the data. • The data name
OL OL UR UR	If the OL indicator is red, it indicates that an overload occurred. During measurement, the overload stays red as soon as an overload is detected until a new average period starts. In post-process, the overload is red if an overload occurred during the displayed average data. If the UR indicator is blue, it indicates that an under range occurred. During measurement, the under range stays blue only while the under range is detected. In post-process, the under range is blue if an under range occurred during the displayed average data.

Event Viewer Interface



Event Viewer Interface

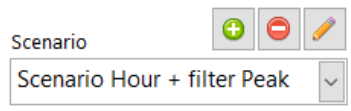
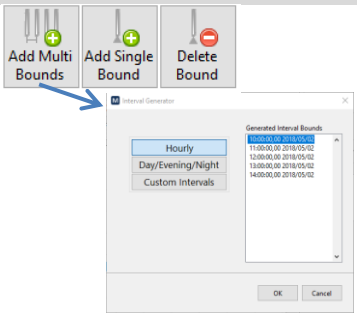
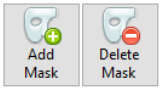
The Event Viewer allows reviewing the event in detail using the audio signal, the pictures and the average data. To launch the Event Viewer interface, click on an event in the event graph above the time history graph to view the selected event. The  button can be used to export the event components into standard files.

3.4 Post-Analysis

Post-Analysis Interface

The Post-Analysis tab allows the user to apply Bonds and Masks on the raw data. The Bonds define the boundaries of the post-analysis periods from which the masked data will be ignored in the average evaluation. Since the graph can only contain one plot, it may be necessary to go back and forth between the Display and Post Analysis tabs in order to switch between the raw data and the Post Interval of the Post Analysis.

Time History Graph

Control / Indicator	Description
	Optionally, several scenarios can be defined. Each scenario contains its own set of Bonds and Masks as defined by the user. It is useful to quickly switch from a scenario to another without losing your works. Scenarios are automatically recorded within the measurement file as the analysis changes.
	The bounds appear as vertical lines on the graph. Their color is generally grey and is purple if selected. Once the Add Single Bound button is activated, the user can add bonds manually on the graph. Bonds can also be added as a pattern using the Add Multi Bounds. The Hourly option is commonly used to set 1-hour periods aligned with the clock. The Delete Bound button deletes any selected bond (purple) or can delete all bonds if none are selected.
	The masks appear as plain background zones on the graph. Their color is generally grey and is purple if selected. Once the Add Mask button is activated, the user can add masks manually on the graph. A mask zone starts on mouse press and stops on mouse release. The Delete Mask button deletes any selected mask (purple) or can delete all masks if none are selected.