

# APU Loudness Meter



User Manual  
v1.9.15

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# 1. Introduction

[APU Loudness Meter](#) is a modern loudness analysis plug-in released by [APU Software, LLC](#). This plug-in is designed to provide both real-time monitoring and full histogram analysis of your audio's loudness over time. Here you can read about the different features and parameters available with the meter.

## 2. Parameters

This software supports a variety of parameters, most of which can be adjusted in real-time. This section provides an overview of each parameter, with each subsection detailing the parameters for the associated tab in the user interface. From within the user interface, you can also hover the mouse over a slider, combo-box, or checkbox to see a popup description of the parameter.

### 2.1. Meters



The meters tab contains configuration, visualization, and statistics for loudness analysis. This section details each of the individual parameters and components.

### 2.1.1. Presets

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The meter's presets combo-box contains a collection of basic presets.

You can configure whether or not to [load preset visuals](#) when switching between presets, and you can switch between loading dark or light themes through the [prefer dark themes](#) parameter.

Currently, the following presets are available ("Full Reset" restores all default parameter values):

- Full Reset
- Live Monitoring - APU Default
- Live Monitoring - Apple
- Live Monitoring - Deezer
- Live Monitoring - Spotify/Tidal/YouTube
- Live Monitoring - Spotify Loud
- Full Histogram - APU Default
- Full Histogram - Apple
- Full Histogram - Deezer
- Full Histogram - Spotify/Tidal/YouTube
- Full Histogram - Spotify Loud

### 2.1.2. Loudness type

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The loudness type combo-box allows you to configure which type of loudness measurement is used by the meter. Each loudness type supports channel-split or channel-linked processing. Channel-split treats each channel independently, while channel-linked integrates across all channels.

Two of the supported loudness types use a popular modern measurement standard for perceived loudness called [LUFS](#). These loudness types are momentary (400ms window) and short-term (3s window).

There are also two [peak](#) loudness types (True Peak and Peak) as well as traditional [RMS](#) (300ms window). True Peak is an improvement on [peak](#) which takes into consideration waveform behavior between samples, which allows it to properly respond to inter-sample peaks. Peak mode loudness types use a [blocksize](#) window.

### 2.1.3. Meter type

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The meter type combo-box allows you to configure which type of metering measurement is displayed by the visualizer. These measurements are displayed using the current [output](#) color.

Integrated meter type takes into consideration the full history of audio since last reset, and is implemented according to the [LUFS](#) specification.

History average, history peak, and history min are based on the [history](#) buffer, whose length is configurable from the [visualization](#) tab. This allows you to continuously analyze any length of time supported by the [history length](#) parameter.

Global average, global peak, and global min analyze all loudness measurements since the last reset.

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#### 2.1.4. Visualization

The visualization component displays a continuously evolving real-time view of your [source](#) and [output](#) loudness over time. There are currently two main types of visualizations: [history](#) and [histogram](#). [History](#) displays a rolling window of the most recent history of loudness samples. [Histogram](#) divides this history up into buckets and displays the relative proportion of each bucket in real-time.

You can hover the mouse over a bucket to see the loudness range the bucket corresponds to.

The visualization component also displays the current [target range](#), allowing you to precisely target this range based on the dynamics of the audio. Detailed visualization settings can be adjusted from the [visualization](#) tab, with some features also available by right clicking on the visualization component.

You can double-click the visualization component to zoom in and hide everything else.

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#### 2.1.5. Show Meter

The “Show meter” option allows you to show or hide the [meter type](#) visualization.

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#### 2.1.6. Show Stats

The “Show stats” option allows you to show or hide the loudness statistics text overlay.

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#### 2.1.7. Raster type

The raster type parameter allows you to specify the type of raster visualization. You can select between [history](#) and [histogram](#) views, with either loudness or delta values. Loudness values match the currently selected [loudness type](#) while delta values take the difference between [target](#) and [output](#) (meter) loudness.

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#### 2.1.8. Reset Meters

The “Reset Meters” button resets [history](#) and [histogram](#) visualizations, along with any accumulated statistics data.

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#### 2.1.9. Load file

The “Load File ...” button allows you to perform analysis on any supported audio file. This will also clear all previous [history](#) and [histogram](#) visualizations, along with any accumulated statistics data.

This feature automatically switches to [histogram](#) view after analyzing the file, which allows you to quickly view the dynamic range of the audio material. Statistics will reflect the contents of the audio as well.

After opening an audio file, this button will change to “Close File” so you can analyze live audio again.

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#### 2.1.10. Target range

The target range parameter allows you to specify a min and max loudness value for the target range, displayed in the visualization component as an overlay.

See [range sliders](#) for information about range sliders in general.

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#### 2.1.11. Learn target range

The learn target range parameter allows you to enable or disable learning for [target range](#).

While active, [target range](#) will be adjusted to accommodate the min and max input loudness. This is useful for quickly setting the target range to match the input loudness. Once the target range is set, you can disable learning to prevent the target range from changing.

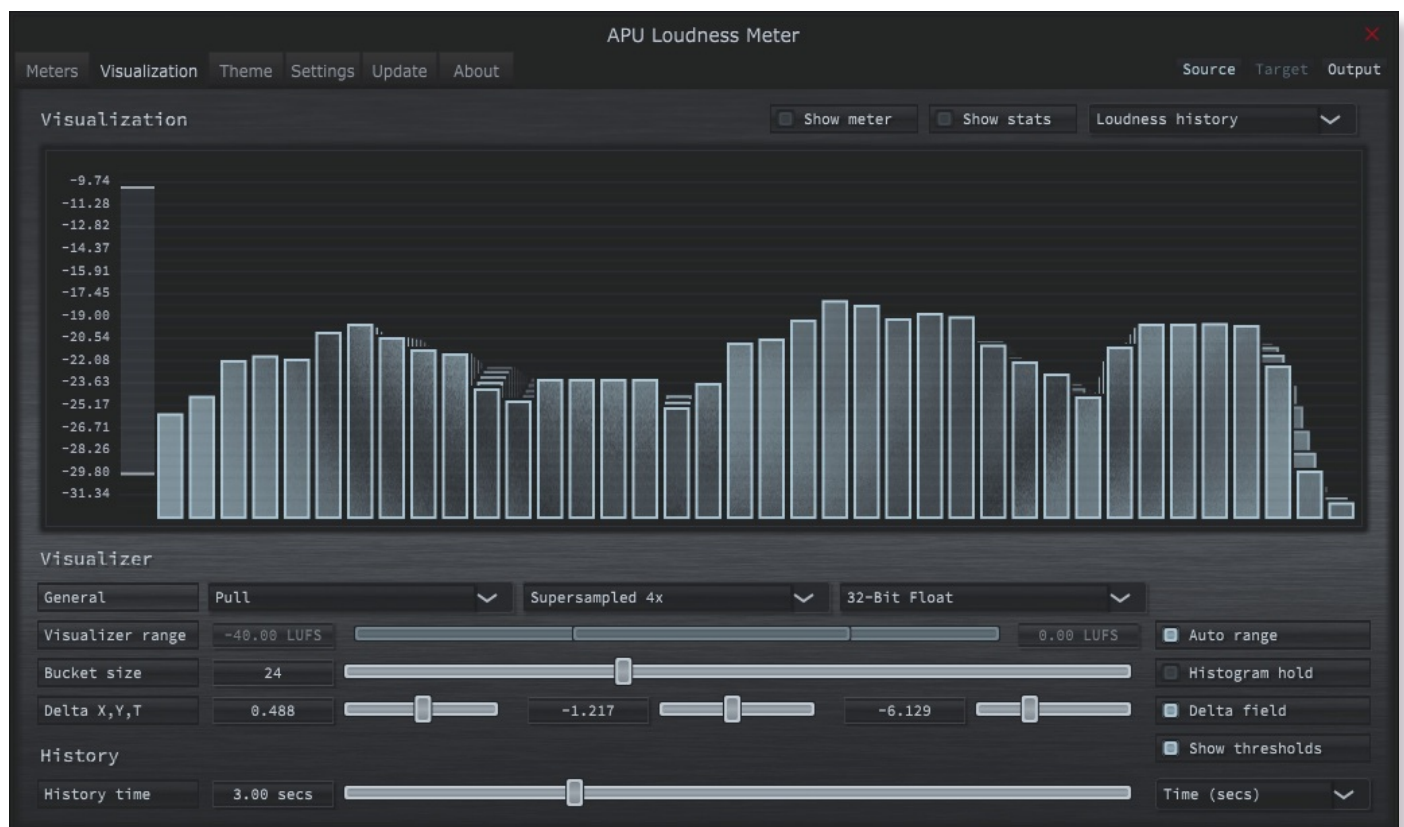
### 2.1.12. Target range presets

Target range presets are provided for convenience as an example set of industry related loudness ranges. The average loudness and loudness range are provided in the preset names in parenthesis. These values were transcribed from the [RTW](#) delivery standards page. Note that some presets only include the average loudness, not a range. In those cases, a default range will be set.

Currently, the following target range presets are available:

- APU Default (-20/10)
- Netflix Online Streaming (-27)
- US TV ATSC A/85 Broadcast (-24)
- EU R128 Broadcast (-23)
- AES Streaming (-18)
- Apple (-16)
- Deezer (-15)
- Spotify/Tidal/YouTube (-14)
- Spotify Loud (-11)
- Full Range

## 2.2. Visualization



The visualization tab contains parameters related to real-time configuration of the meter's visualizations. This section describes these various settings.

### 2.2.1. Delta field type

The delta field type parameter allows you to specify the type of delta field used by the visualization.

The delta field is basically a mapping from each source pixel on the screen to a destination pixel. Pixel shaders are used to iteratively apply this delta field using interpolation and some light dithering effects. This feature is purely for aesthetic purposes and has no effect on the audio.

[Raster type](#) effects are drawn into the delta field on each frame.

### 2.2.2. Super-sampling mode

---

The super-sampling mode parameter determines the amount of super-sampling to use when rendering visualizations. The default render dimensions match the default plug-in window size. You can enable super-sampling to multiply this resolution by up to 4x.

### 2.2.3. Bits per pixel

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The bits-per-pixel parameter determines the number of bits per pixel to use when rendering visualizations. The default bpp is the best performing. You can increase bpp to improve visual quality.

### 2.2.4. Bucket size

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The bucket size parameter determines the size in pixels of visualization buckets (rectangles).

### 2.2.5. Histogram hold

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The histogram hold parameter enables or disables “hold” mode for the [histogram](#) raster types. While “hold” mode is enabled, the histogram will continuously accumulate measurements indefinitely. This can be used to capture a full duration view of your source audio. This allows you to easily adjust ranges to target to a specific region of the full dynamic range.

The histogram will still continuously accumulate measurements while “hold” mode is disabled, but for each new measurement the oldest measurement in history is replaced. This results in a continuously evolving histogram of duration specified by the [history length](#) parameter.

### 2.2.6. Delta X/Y/T

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The delta X/Y/T parameters are provided to the visualization [delta field](#) in order to manipulate the delta field in real-time. The exact behavior of each parameter depends on the active [delta field type](#).

### 2.2.7. Delta field

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The delta field parameter allows you to enable or disable the visualization delta field.

The delta field is basically a mapping from each source pixel on the screen to a destination pixel. Pixel shaders are used to iteratively apply this delta field using interpolation and some light dithering effects. This feature is purely for aesthetic purposes and has no effect on the audio.

[Raster type](#) effects are drawn into the delta field on each frame.

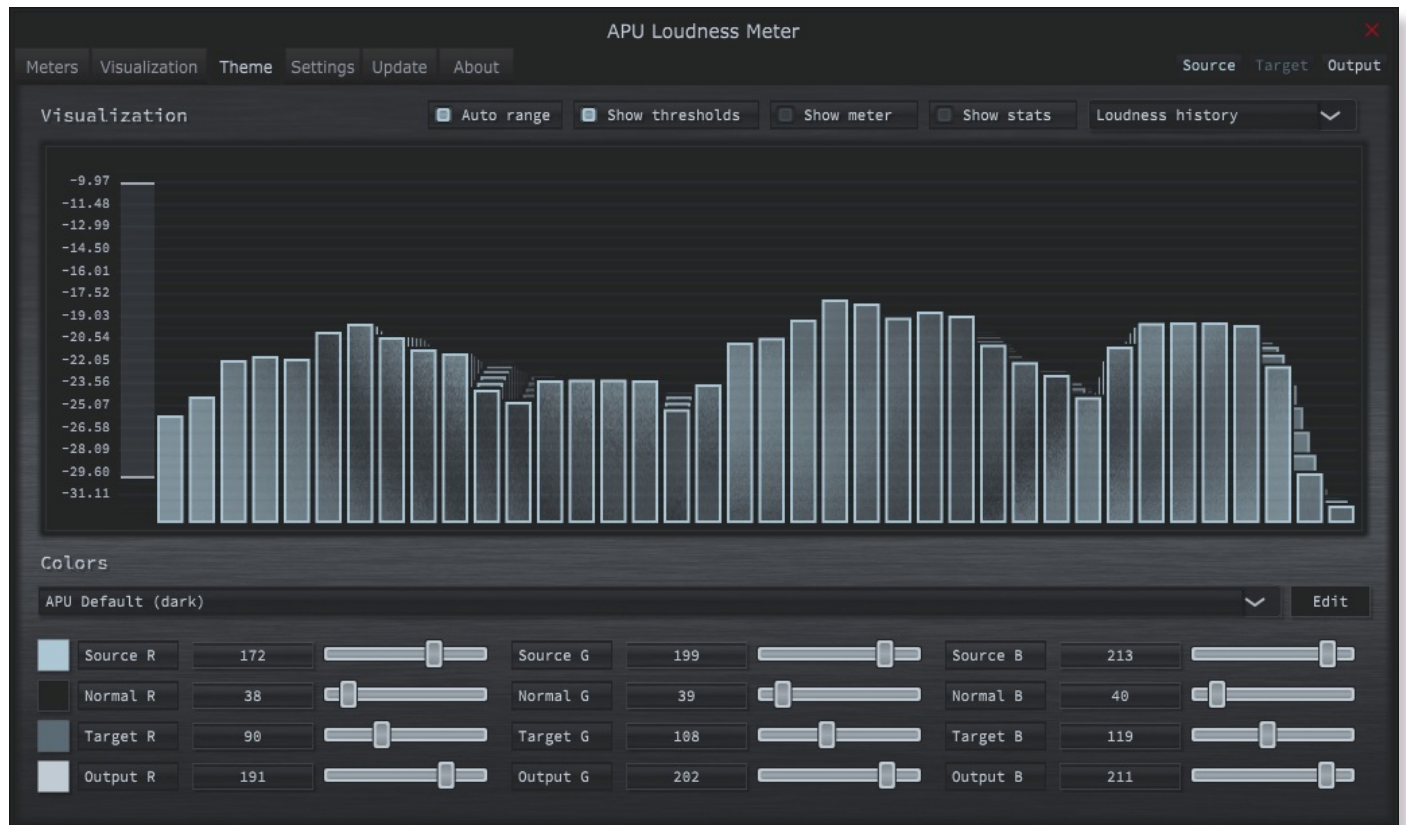
### 2.2.8. History length

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The history length parameter allows you to change the duration of visualization history. This history is a rolling-window where each new loudness sample pushes out the oldest sample, maintaining a continuous history length with the duration you’ve configured here. Note that this setting applies both to [history](#) and [histogram](#) raster types.

During [histogram hold](#) the histogram has an effectively infinite history length.

## 2.3. Theme



The theme tab contains parameters related to color themes. Here you can select between the bank of color theme presets, or configure the individual colors yourself.

### 2.3.1. Theme presets

The theme presets combo-box allows you to switch between a variety of theme presets. Each theme has a light and dark variation. Switching between theme presets will load values into [source color](#), [normal color](#), [target color](#) and [output color](#).

Currently, the following themes are available:

- APU Default (dark)
- APU Default (light)
- Night Sea (dark)
- Night Sea (light)
- Midnight (dark)
- Midnight (light)
- Cozy (dark)
- Cozy (light)
- Redwood (dark)
- Redwood (light)
- Ruins (dark)
- Ruins (light)
- Purple Velvet (dark)
- Purple Velvet (light)
- Peas (dark)
- Peas (light)
- Jungle (dark)
- Jungle (light)
- YIOrBr (dark)
- YIOrBr (light)



### 2.3.2. Source color

The source color parameters control the red, green, and blue components of the [source](#) color.

The source color is used in a variety of contexts, from interactive widgets to visualization elements. This color signifies that an element relates to the [source](#) signal in some way. This color is expected to contrast against the [normal color](#) to some extent.

### 2.3.3. Normal color

The normal color parameters control the red, green, and blue components of the “normal” color.

The normal color is used in a variety of contexts, from interactive widgets to visualization elements. This color signifies that an element is essentially neutral, not related to [source](#), [target](#) or [output](#) signal. This color is expected to contrast against the [source color](#), [target color](#), and [output color](#) to some degree.

### 2.3.4. Target color

The target color parameters control the red, green, and blue components of the [target](#) color.

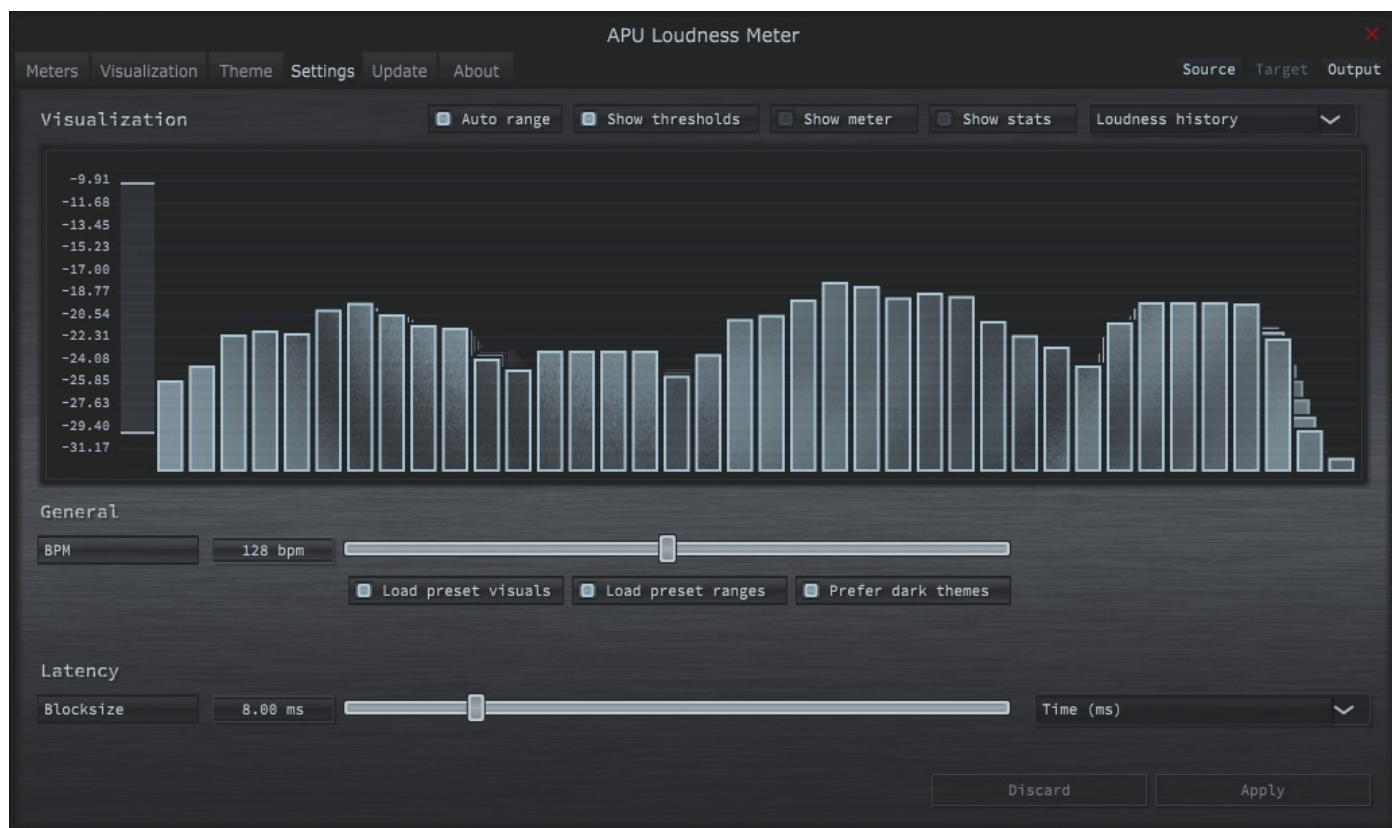
The target color is used in a variety of contexts, from interactive widgets to visualization elements. This color signifies that an element relates to the [target](#) signal in some way. This color is expected to contrast against the [normal color](#) to some extent.

### 2.3.5. Output color

The output color parameters control the red, green, and blue components of the [output](#) color.

The output color is used in a variety of contexts, from interactive widgets to visualization elements. This color signifies that an element relates to the [output](#) signal in some way. This color is expected to contrast against the [normal color](#) to some extent.

## 2.4. Settings



The settings tab contains various additional parameters. These parameters are broken down between General and Latency parameters. Since Latency parameters impact [delay compensation](#), changes to these parameters are deferred until you click the Apply button. It is generally not advisable to automate the parameters in the Latency section.

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### 2.4.1. BPM

The bpm option allows you to set the BPM used by tempo-relative parameters.

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### 2.4.2. Host BPM

The host bpm option enables usage of the host's BPM for tempo-relative parameters. When disabled, the [bpm](#) parameter is used instead.

This parameter is not available (nor applicable) to the standalone application.

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### 2.4.3. Load preset visuals

The load preset visuals option allows you to enable/disable the loading of visualization and [theme](#) settings when loading [presets](#). All other settings will still be loaded; this setting only has an impact on the visual appearance of the plug-in and does not impact the audio.

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### 2.4.4. Load preset ranges

The load preset ranges option allows you to enable/disable the loading of [target range](#) when loading [presets](#). All other settings will still be loaded.

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### 2.4.5. Prefer dark themes

The prefer dark themes option causes presets to load the dark version of their associated color theme. Note that this feature is only applicable if [load preset visuals](#) is enabled.

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### 2.4.6. Blocksize

The block size parameter determines the time resolution of the meter's loudness measurements. Generally speaking, lower block sizes will give more accurate results. However, lower block sizes also require more CPU resources, so it is necessary to find a balance. You can squeeze improved quality and/or performance out of the meter by tuning this setting based on your available CPU resources.

BPM units for block size are evaluated once at the time you press Apply.

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### 2.4.7. Delay compensation

The delay compensation parameter determines whether or not the plug-in will report latency to the host. Delay compensation is used by hosts to keep audio synchronized across channels.

The delay compensation option is not available (nor applicable) to the standalone application.

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## 2.5. Update

The update tab allows you to check for the latest product versions. Just click "Check for updates" to see the latest version numbers. If you're not running the latest version, you can click "Download" to open the download page in your default browser.

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## 2.6. About

The about tab contains basic information about the plug-in.

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# 3. Glossary

This section defines some of the concepts used within the software.

### 3.1. Range sliders

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Range sliders are used throughout the plug-in in order to specify the upper and lower boundaries of a range. These ranges can be controlled via mouse in various ways.

- Click and drag the lower thumb to adjust the minimum value.
- Click and drag the upper thumb to adjust the maximum value.
- Click and drag the region between slider thumbs to move both values. This allows you to adjust the average loudness without expanding/contracting the dynamic range.
- Ctrl + click and drag the region between slider thumbs to expand/contract range without changing the average (center) value. Drag the mouse up and down, left and right are ignored.
- Shift + click and drag the region between slider thumbs to combine both. Drag the mouse up and down to expand/contract range. Drag the mouse left and right to move both values.

### 3.2. History

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One of the primary views into your audio that this software provides is real-time history. The history view maintains a recent history of loudness measurements, continuously displaying them in [FIFO](#) order. This view helps you understand how the signal is changing over time, in real-time. [History length](#) and [bucket size](#) can be configured dynamically without forcing the history to reset.

### 3.3. Histogram

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One of the primary views into your audio that this software provides is a real-time histogram. Histograms in general provide a quick and intuitive way to understand the relative frequency of different measurements. This is very useful when judging the overall dynamic range of the audio. The histogram provided by this software is capable of changing [history length](#), [bucket size](#) and size continuously.

### 3.4. Source

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The term “source” is used throughout the plug-in to identify the plug-in’s input source signal. This signal is represented in the user interface by the current theme’s [source color](#).

### 3.5. Target

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The term “target” is used throughout the plug-in to identify the configured target range loudness. This signal is represented in the user interface by the current theme’s [target color](#).

### 3.6. Output

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The term “output” is used throughout the plug-in to identify the [meter type](#) signal. This signal is represented in the user interface by the current theme’s [output color](#).

## 4. Credits

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This software was developed by [APU Software, LLC](#) and is available as VST (windows x64/x86, macOS universal), Audio Unit (macOS universal), or Standalone Application. The software libraries below are utilized for portions of the software:

- [JUCE](#) (cross-platform audio and user interface framework)
- [Boost](#) (header-only algorithms)
- [libebur128](#) (loudness measurements)

Demo video song credits:

- Annasara - A Lifetime Rolls By, licensed via [Audiio](#).
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