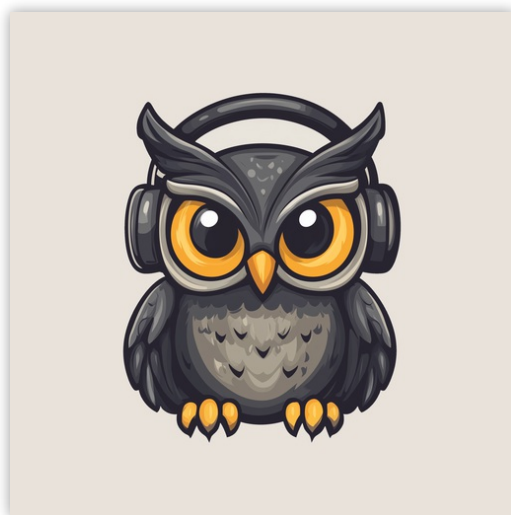


# APU Loudness Contour



User Manual  
v4.1.7

# Table of Contents

Table of Contents	2
1. Introduction	4
2. Parameters	4
2.1. Contour	4
2.1.1. Presets	5
2.1.2. Channel mode	5
2.1.3. Output type	5
2.1.4. Visualization	5
2.1.5. FFT scale type	6
2.1.6. FFT window type	6
2.1.7. FFT window size	6
2.1.8. Kaiser beta	6
2.1.9. Raster type	6
2.1.10. Raster orientation	6
2.1.11. Phase mode	6
2.1.12. Loudness contour type	7
2.1.13. Makeup gain	7
2.1.14. Contour weight	7
2.1.15. Reference SPL	7
2.1.16. Output gain	7
2.2. Visualization	8
2.2.1. Auto range	8
2.2.2. Visual range presets	8
2.2.3. Loudness range	8
2.2.4. Layout options	9
2.2.5. Layout source mode	9
2.2.6. Layout target mode	9
2.2.7. Layout output mode	9
2.2.8. Delta field type	10
2.2.9. Bits per pixel	10
2.2.10. Bucket size	10
2.2.11. Histogram hold	10
2.2.12. Delta X/Y/T	10
2.2.13. Delta field	10
2.2.14. Shader params	10
2.2.15. Show contour	10
2.2.16. Panel params	11
2.2.17. History length	11
2.2.18. Show peak meter	11
2.2.19. Show axis labels	11
2.2.20. Show axis lines	11
2.2.21. Show alt axis labels	11
2.2.22. Show alt axis lines	11
2.3. Theme	12
2.3.1. Theme presets	13
2.3.2. Source color	13
2.3.3. Normal color	13
2.3.4. Target color	13
2.3.5. Output color	14
2.3.6. Textures	14
2.4. Settings	14
2.4.1. BPM	14
2.4.2. Host BPM	15
2.4.3. Velocity sensitive knobs	15
2.4.4. Load preset visuals	15
2.4.5. UI Scaling	15
2.4.6. Dark mode	15
2.4.7. Blocksize	15
2.4.8. Delay compensation	15
2.5. Update	15
2.6. About	15
3. Glossary	16
3.1. Range sliders	16
3.2. Histogram	16
3.3. Source	16
3.4. Target	16
3.5. Output	16
4. Credits	17
4.1. MIT License (libebur128)	17

4.2. MIT License (melatonin_blur)	18
4.3. FFTPACK License (pffft)	18

# 1. Introduction

[APU Loudness Contour](#) is an ‘equal-loudness’ contour plug-in released by [APU Software, LLC](#). This plug-in is designed to apply a variety of ‘equal-loudness’ filters to audio. Here you can read about the different features and parameters available with the plug-in.

## 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. Contour



The contour tab contains configuration and visualization for loudness contours. This section details each of the individual parameters and components.

### 2.1.1. Presets

---

The contour'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 [dark mode](#) parameter.

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

- Full Reset
- Contemporary Presence (Modern)
- Nuanced Presence (Refined)
- Technical Mid-Boost (Precise)
- A-Weighted Presence (Environmental)
- Perceptual Clarity (LUFS)
- Vintage Mids EQ (Classic)
- Gentle Mid Shift (High-SPL)
- Hiss Focus EQ (Broadcast)
- Spectral Histogram (Flat)
- Loudness Compensation (Modern)
- Loudness Compensation (Refined)
- Loudness Compensation (Precise)
- Loudness Compensation (Environmental)
- Loudness Compensation (LUFS)
- Loudness Compensation (Classic)
- Subtle Loudness Compensation (High-SPL)
- Creative Scoop EQ (Broadcast)

### 2.1.2. Channel mode

---

This channel mode parameter determines which channel the visualizer shows. Channel-linked shows the average of all channels, while channel-split shows only the selected channel.

### 2.1.3. Output type

---

The output type options allows you to configure which type of samples to output.

- Default output type corresponds to the contour's output
- Bypass output type corresponds to the contour's source
- Delta output type corresponds to the contour's output minus source

Output gain and dry/wet are bypassed for Delta output type

### 2.1.4. Visualization

---

The visualization component displays a continuously evolving real-time view of your [source](#), [target](#), and [output](#) spectrum over time.

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

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 resize and hide everything else.

#### 2.1.5. FFT scale type

---

The FFT scale type parameter determines the frequency scale used for the visualization. The following options are available:

- Linear: Linear frequency scale with frequency labels
- Log: Logarithmic frequency scale with frequency labels
- Note: Logarithmic frequency scale with note labels

#### 2.1.6. FFT window type

---

The FFT window type parameter determines the window type used for the spectral histogram's FFT. The following options are available:

- Rect: Rectangular window
- Hann: Hann window
- Hamming: Hamming window
- Blackman: Blackman window
- Kaiser: Kaiser window

When using the Kaiser window, the [Kaiser beta](#) parameter is used to determine the window shape.

#### 2.1.7. FFT window size

---

The FFT window size parameter determines the size of the spectral histogram's FFT window.

The FFT window size determines a trade-off between frequency resolution and time resolution. A larger window size provides better frequency resolution, while a smaller window size provides better time resolution.

#### 2.1.8. Kaiser beta

---

The Kaiser beta parameter determines the shape of the window when Kaiser [FFT window type](#) is selected.

#### 2.1.9. Raster type

---

The raster type parameter allows you to enable/disable the spectral histogram raster visualization.

#### 2.1.10. Raster orientation

---

The raster orientation parameter allows you to specify the rotation of the raster visualization. You can select between horizontal and vertical orientations.

#### 2.1.11. Phase mode

---

The phase mode parameter determines the phase mode used for the contour filters. The following options are available:

- Minimum: Minimum phase mode
- Linear: Linear phase mode

Latency is normalized across phase modes to allow for more seamless real-time adjustments.

### 2.1.12. Loudness contour type

---

The loudness contour type parameter determines the type of loudness contour used for filtering. The following options are available:

- None
- K-weighting
- ECMA-418
- ISO-226:2003
- ISO-226:2023
- Fletcher-Munson
- ITU-R 468
- A-weighting
- C-weighting

### 2.1.13. Makeup gain

---

The makeup gain parameter enables an estimated makeup gain for the current [loudness contour type](#).

The amount of makeup gain is determined by the difference in ungated LUFS measurement between an unfiltered pink noise signal and the filtered pink noise signal. This gain is automatically interpolated between contours when appropriate.

Makeup gain is an estimate, you can adjust the [output gain](#) parameter to fine-tune the output level.

Makeup gain is reflected in the loudness contour visualization, unlike the [output gain](#) parameter.

### 2.1.14. Contour weight

---

The contour weight parameter determines the weighting of the contour filter. Negative values invert the frequency response of the filter. Zero is a flat filter.

### 2.1.15. Reference SPL

---

The reference SPL parameter determines the reference sound pressure level used for the contour filter. This is used to determine the amount of gain applied to the contour filter.

Reference SPL is available for ISO-226:2003, ISO-226:2023, and Fletcher-Munson loudness contour types.

### 2.1.16. Output gain

---

The output gain parameter allows you to apply additional gain to the output of the contour.

## 2.2. Visualization



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

### 2.2.1. Auto range

The auto range parameter enables or disables the visualization's auto range finding capabilities. This feature operates by analyzing the continuous histogram at each frame to determine a reasonable range for that moment in time. This range is then followed and adjusted smoothly over time.

### 2.2.2. Visual range presets

Visual range presets are provided for convenience to quickly adjust the dB range of the visualizer.

Currently, the following visual range presets are available:

- Auto Range (Global)
- Auto Range (Per Panel)
- Standard Reference ( $\geq -90$ )
- Deep Range ( $\geq -120$ )
- Full Range ( $\geq -160$ )
- Custom Range ...

### 2.2.3. Loudness range

The loudness range parameter allows the visualization loudness range to be set manually. In order for this range to be enabled and used, the [visual range presets](#) parameter must be set to "Custom Range"

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



#### 2.2.4. Layout options

---

The options menu allows you to configure the layout of the visualization. The following options are available:

- [layout source mode](#) : Specifies the layout mode for the [source](#) signal.
- [layout target mode](#) : Specifies the layout mode for the [target](#) signal.
- [layout output mode](#) : Specifies the layout mode for the [output](#) signal.
- [raster type](#) : Specifies the type of raster visualization.
- [raster orientation](#) : Specifies the orientation of the raster visualization.
- [show contour](#) : Specifies whether or not to show current loudness contour for all panels
- [show peak meter](#) : Specifies whether or not to show peak meter.
- [show axis labels](#) : Specifies whether or not to show loudness axis labels.
- [show axis lines](#) : Specifies whether or not to show loudness axis lines.
- [show alt axis labels](#) : Specifies whether or not to show frequency axis labels.
- [show alt axis lines](#) : Specifies whether or not to show frequency axis lines.

Each layout mode has an AUTO option which automatically selects the best layout mode based on the current context.

#### 2.2.5. Layout source mode

---

The layout source mode parameter allows you to configure the layout of the visualization's source panel.

Currently, the following layout source modes are available:

- None (No source panel is displayed)
- Auto (Automatically selects the best layout mode based on the current context)
- Source only (Draws just the [source](#) signal)
- Source over Target (Draws the [target](#) signal first, then the [source](#) signal on top)
- Source over Output (Draws the [output](#) signal first, then the [source](#) signal on top)

#### 2.2.6. Layout target mode

---

The layout target mode parameter allows you to configure the layout of the visualization's target panel.

Currently, the following layout target modes are available:

- None (No target panel is displayed)
- Auto (Automatically selects the best layout mode based on the current context)
- Target only (Draws just the [target](#) signal)
- Target over Source (Draws the [source](#) signal first, then the [target](#) signal on top)
- Target over Output (Draws the [output](#) signal first, then the [target](#) signal on top)

#### 2.2.7. Layout output mode

---

The layout output mode parameter allows you to configure the layout of the visualization's output panel.

Currently, the following layout output modes are available:

- None (No output panel is displayed)
- Auto (Automatically selects the best layout mode based on the current context)
- Output only (Draws just the [output](#) signal)
- Output over Source (Draws the [source](#) signal first, then the [output](#) signal on top)
- Output over Target (Draws the [target](#) signal first, then the [output](#) signal on top)

### 2.2.8. 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.

### 2.2.9. Bits per pixel

---

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.

### 2.2.10. Bucket size

---

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

### 2.2.11. Histogram hold

---

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.

### 2.2.12. Delta X/Y/T

---

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](#).

### 2.2.13. Delta field

---

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.

### 2.2.14. Shader params

---

The shader parameters control various aspects of visualization rendering. The following options are available:

- Shader param 1: Delta field fade rate. Lower values leave longer trails.
- Shader param 2: Curve fill transparency. Lower values make the curve more transparent, leaving only the edge(s) visible.
- Shader param 3: Curve edge thickness. Lower values make the edge thinner.

### 2.2.15. Show contour

---

The show contour parameter allows you to enable or disable contour drawing in the visualization.

Show contour applies to all panels in the visualization, including [source](#), [target](#), and [output](#) signals.

### 2.2.16. Panel params

---

The panel parameters control various aspects of panel rendering. The following options are available:

- Panel param 1: Panel alpha (transparency), 0.0 to remove panel completely
- Panel param 2: Panel hue (rotates through normal, source, target, output).
- Panel param 3: Panel hue intensity

### 2.2.17. History length

---

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.

### 2.2.18. Show peak meter

---

The show peak meter parameter allows you to enable or disable peak meter drawing next to the visualizer.

### 2.2.19. Show axis labels

---

The show axis labels parameter allows you to enable or disable axis drawing in the visualization.

The axis is scaled relative to the [loudness range](#), which can be manual or [auto range](#).

### 2.2.20. Show axis lines

---

The show axis lines parameter allows you to enable or disable axis line drawing in the visualization.

axis lines are drawn at each [Show axis labels](#).

### 2.2.21. Show alt axis labels

---

The show axis labels parameter allows you to enable or disable frequency axis drawing in the visualization.

### 2.2.22. Show alt axis lines

---

The show axis lines parameter allows you to enable or disable frequency axis line drawing in the visualization.

axis lines are drawn at each [Show alt axis labels](#).

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
- APU Red
- APU Vermilion
- APU Orange
- APU Amber
- APU Yellow
- APU Lime
- APU Chartreuse
- APU Harlequin
- APU Green
- APU Erin
- APU Spring
- APU Aquamarine
- APU Cyan
- APU Turquoise
- APU Azure
- APU Cerulean
- APU Blue
- APU Indigo
- APU Violet
- APU Purple
- APU Magenta
- APU Raspberry
- APU Rose
- APU Crimson

### 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.

### 2.3.6. Textures

The textures configuration allows you to change the user interface textures.

The panel texture is used for the background of the user interface and has the [shader params](#) applied. The meter texture is used to fill the visualization effects. The background texture is used throughout the plugin for shading.

These settings are stored with user scope, so you don't need to change them with every instance. Closing a texture will revert to the default internal texture.

Typically, the panel texture should be very dark and the meter texture should be very light.

## 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.

### 2.4.1. BPM

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

#### 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.

#### 2.4.3. Velocity sensitive knobs

---

If enabled, this will turn on velocity-sensitive dragging, so that the faster the mouse moves, the bigger the movement to the knobs. This helps when making accurate small-scale adjustments.

This parameter is saved at user scope, so it will be remembered between sessions.

#### 2.4.4. 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.

This parameter is saved at user scope, so it will be remembered between sessions.

#### 2.4.5. UI Scaling

---

The UI scaling option allows you to set the scaling of the user interface. This is useful for high-DPI displays, where the default scaling may be too small to read comfortably.

This parameter is saved at user scope, so it will be remembered between sessions.

#### 2.4.6. Dark mode

---

The dark mode toggle enables/disables dark mode. When enabled, theme colors have their brightness inverted.

#### 2.4.7. Blocksize

---

The block size parameter determines the time frequency of FFT filtering. 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 by tuning this setting based on your available CPU resources.

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

#### 2.4.8. 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.

### 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.

### 2.6. About

---

The about tab contains basic information about the plug-in. This is also where you can activate or deactivate your product keys and check license status.



## 3. Glossary

---

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

### 3.1. Range sliders

---

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. Histogram

---

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.

### 3.3. Source

---

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](#).

### 3.4. Target

---

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](#).

### 3.5. Output

---

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



## 4. Credits

---

This software was developed by [APU Software, LLC](#) and is available as VST (windows x64/x86, macOS universal), Audio Unit (macOS universal), Pro Tools AAX (windows x64, macOS universal), or Standalone Application (windows x64/x86, macOS universal). 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)
- [melatonin blur](#) (blur effects)
- [PFFFT](#) (FFT library)

Demo video song credits:

- MVMT Music - Everyday Magic, licensed via [Shutterstock](#)



### 4.1. MIT License (libebur128)

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## 4.3. FFTPACK License (pffft)

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