

# APU Loudness Compressor



User Manual  
v1.9.14

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# 1. Introduction

[APU Loudness Compressor](#) is a modern loudness compressor/expander plug-in released by [APU Software, LLC](#). This plug-in is designed to improve several aspects of dynamic range control, both in terms of sound quality and user controls. Here you can read about the different features and parameters available with the plug-in, and get a general sense of how it differs from other compressors and why.

## 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. Compression



The compression tab contains configuration and visualization for loudness compression/expansion. This section details each of the individual parameters and components.

### 2.1.1. Presets

---

The compressor's presets combo-box contains a collection of basic presets, one for each combination of [loudness type](#) and latency configuration. The low-latency presets introduce minimal delay, while the look-ahead presets introduce more delay in exchange for the ability to preemptively respond to the source signal.

See [look-ahead](#) for an understanding of how delay compensation works in the plug-in.

When switching between presets, your [source range](#) and [target range](#) won't be modified. This is done to make it easier to flip through different compressor presets after you've configured the range settings. Note that peak modes have their own units scale and as a result they use a separate source and target range; the sliders for these settings are swapped into view automatically when switching between loudness modes.

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. These settings are visual only, they don't have any impact on the audio behavior of the compressor.

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

- Full Reset
- Mixing & Mastering - Present (low-latency)
- Mixing & Mastering - Deep (low-latency)
- Mixing & Mastering - Traditional (low-latency)
- Mixing & Mastering - Maximizer TP (low-latency)
- Mixing & Mastering - Maximizer PK (low-latency)
- Mixing & Mastering - Present (look-ahead)
- Mixing & Mastering - Deep (look-ahead)
- Mixing & Mastering - Traditional (look-ahead)
- Mixing & Mastering - Maximizer TP (look-ahead)
- Mixing & Mastering - Maximizer PK (look-ahead)

### 2.1.2. Loudness type

---

The loudness type combo-box allows you to configure which type of loudness measurement is used by the compressor. 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. Output type

---

The output type combo-box allows you to configure which type of samples to output.

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

#### 2.1.4. Visualization

---

The visualization component displays a continuously evolving real-time view of your [source](#), [target](#), 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 [source range](#) and [target range](#), including knee width, allowing you to precisely target these ranges 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 resize and hide everything else.

#### 2.1.5. Show transfer

---

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

If this option is enabled, the transfer function will be drawn next to the configured [raster type](#).

The transfer function is rendered using the current [Loudness range](#).

#### 2.1.6. 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 [source](#) and [target](#) or [output](#) loudness.

Delta view is useful for determining how much loudness is being changed, and how much residual there is between [target](#) and [output](#) loudness.

You can also visualize [target](#) vs [output](#) residual via [breath residual](#) option.

#### 2.1.7. Sidechain

---

The sidechain toggle allows you to enable/disable sidechain processing. When enabled, the source signal will come from the plug-in's sidechain channel(s). This allows you to drive compression/expansion using an external source, which can be used for example to [duck](#) the sidechain signal.

Since this compressor is capable of both compression and expansion, the reverse of ducking is also possible (source amplifies in response to sidechain signal above threshold).

#### 2.1.8. Dynamics type

---

The dynamics type combo-box allows you to change the dynamics algorithm type.

- Source:Target transforms from source loudness range to target loudness range
- Compression (downward) reduces the loudness of audio above [threshold](#) by [ratio](#).
- Compression (upward) increases the loudness of sounds below [threshold](#) by [ratio](#).
- Expansion (downward) reduces the loudness of audio below [threshold](#) by [ratio](#).
- Expansion (upward) increases the loudness of sounds above [threshold](#) by [ratio](#).
- Soft Limiting limits the loudness of audio above [threshold](#).

### 2.1.9. Low-Level type

---

The low-level type combo-box allows you to change the compressor's behavior for loudness levels below the [source range](#).

- Makeup applies the difference between [target](#) min and [source](#) min to all loudness levels.
- Bypass leaves loudness levels below [source](#) min untouched (no makeup).
- Gate applies silence to loudness levels below [source](#) min.

The [attack/release](#) and [linear attack/release](#) ballistics apply to all low-level types

### 2.1.10. Source range

---

The source range parameter allows you to specify a min and max loudness value for the [source](#) signal. Loudness values within the source range are mapped onto the [target range](#) to determine the amount of gain reduction or amplification. The resulting target is then followed by the compressor using the configured [attack/release](#) and/or [linear attack/release](#) parameter settings.

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

### 2.1.11. Learn source range

---

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

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

### 2.1.12. Source range presets

---

Source 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 source 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

### 2.1.13. Target range

---

The target range parameter allows you to specify a min and max loudness value for the [target](#) signal. Loudness values within the source range are mapped onto the [target range](#) to determine the amount of gain reduction or amplification. The resulting target is then followed by the compressor using the configured [attack/release](#) and/or [linear attack/release](#) parameter settings.

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

### 2.1.14. 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.

### 2.1.15. 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

### 2.1.16. Threshold

---

The threshold parameter allows you to specify the loudness level where the compressor becomes fully activated. The precise meaning of threshold is dependent on the current [dynamics type](#).

This parameter is unused for source:target [dynamics type](#).

### 2.1.17. Ratio

---

The ratio parameter allows you to specify the compression/expansion ratio. The ratio is applied to signals above or below [threshold](#) (depending on upward/downward compression/expansion).

This parameter is unused for source:target [dynamics type](#).

### 2.1.18. Attack/Release

---

The attack and release parameters allow you to specify the amount of time it takes for a given amount of gain reduction to be applied to the [source](#) signal. Attack refers to the “attack” of applying gain reduction, while release refers to the “release” of this gain reduction. More generally, release refers to gain amplification since it isn’t always necessary for the compressor to “attack” prior to “release” and the two are not always correlated.

Attack and release are traditional ballistic parameters, similar to what you will find on most compressors. See the [Linear attack/release](#) parameters for more direct attack/release behavior. In addition to specifying the attack and release in milliseconds, you can specify them in either sample or BPM-relative units.

### 2.1.19. Linear Attack/Release

---

The linear attack and release parameters allow you to directly specify the rate of change in gain reduction applied to the [source](#) signal. Attack refers to the “attack” of applying gain reduction, while release refers to the “release” of this gain reduction. More generally, release refers to gain amplification since it isn’t always necessary for the compressor to “attack” prior to “release” and the two are not always correlated.

Linear attack and release parameters are different from traditional ballistic compressor parameters. The actual rate of change in gain reduction with the traditional controls is dependent on both the attack or release time and the residual between target gain reduction and current gain reduction. This means the alterations made to the source signal are a complicated combination of the audio’s dynamics. For linear attack and release, the actual rate of change is constant.

This setting can be configured to apply directly, completely overriding the [attack/release](#) ballistics, or as a limit to their rate. The former can be a way to get extremely fast compressor response, while the latter can serve as a barrier to prevent the compressor from attacking or releasing too rapidly during extreme fluctuations in [source](#) loudness.



### 2.1.20. Look-ahead

---

The look-ahead parameter allows you to configure how far in advance the compressor looks for the [source](#) signal. This can be used to align the compressor's response to account for the loudness window time and/or [attack/release](#) times, or simply as a creative effect.

Look-ahead requires that the [look-ahead budget](#) parameter is configured via the [settings](#) tab. This method of look-ahead configuration is used to support real-time adjustments of look-ahead without causing stuttering which would otherwise interfere with A/B testing.

Note that [look-ahead budget](#) adds latency to the compressor in order to function.

### 2.1.21. Look-ahead mode

---

The look-ahead mode parameter allows you to specify the look-ahead algorithm. Front is traditional style which simply delays the input signal by the [look-ahead](#) duration. Other modes scan the look-ahead duration to calculate the min, max, or average over the window.

### 2.1.22. Knee width

---

The knee width parameter allows you to specify the width of the transition regions at [source range](#) and [target range](#) min and max boundaries. Inside these regions, the compressor's gain reduction is smoothly transitioned from on to off and vice versa. Adjusting the knee width effectively makes this transition more or less sudden.

The lower knee transition begins at source min and ends at source min minus knee width. The upper transition begins at source max and ends at source max plus knee width.

Note that the target range knee width is implicitly scaled in proportion to the amount of compression/expansion.

### 2.1.23. Dry/Wet

---

The dry/wet parameter allows you to configure the percentage of compression to mix into the dry signal.

This feature can be used to apply [parallel compression](#).

### 2.1.24. Output gain

---

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

## 2.2. Visualization



The visualization tab contains parameters related to real-time configuration of the compressor'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

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. Breath residual

The breath residual parameter can be used to help visualize compressor behavior. For each frame of the visualization, the current residual between [target](#) and [output](#) loudness is calculated and used to multiply the magnitude of the visualization delta field.

This feature helps you find sections of audio where the compressor is having a difficult time keeping up with the amount of [target](#) gain. This can help guide the configuration of the [attack/release](#) and [linear attack/release](#) parameters. The direction of the multiplication factor is also set to reflect whether the residual occurred in the attack or release direction, so it's possible to get a sense of the overall balance between these residuals.

### 2.2.5. 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 [auto range](#) parameter must be disabled.

Note that there are separate loudness ranges for windowed loudness types and peak loudness types, similar to how the [source range](#) and [target range](#) parameters function.

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

### 2.2.6. 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 and, while taking into account the [source range](#), [target range](#) and [knee width](#), determining a reasonable range for that moment in time. This range is then followed and adjusted smoothly over time.

### 2.2.7. Bucket size

---

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

### 2.2.8. 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.

### 2.2.9. 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](#).

### 2.2.10. 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.

### 2.2.11. Show thresholds

---

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

If this option is disabled, thresholds will still be drawn while changing the associated parameters.

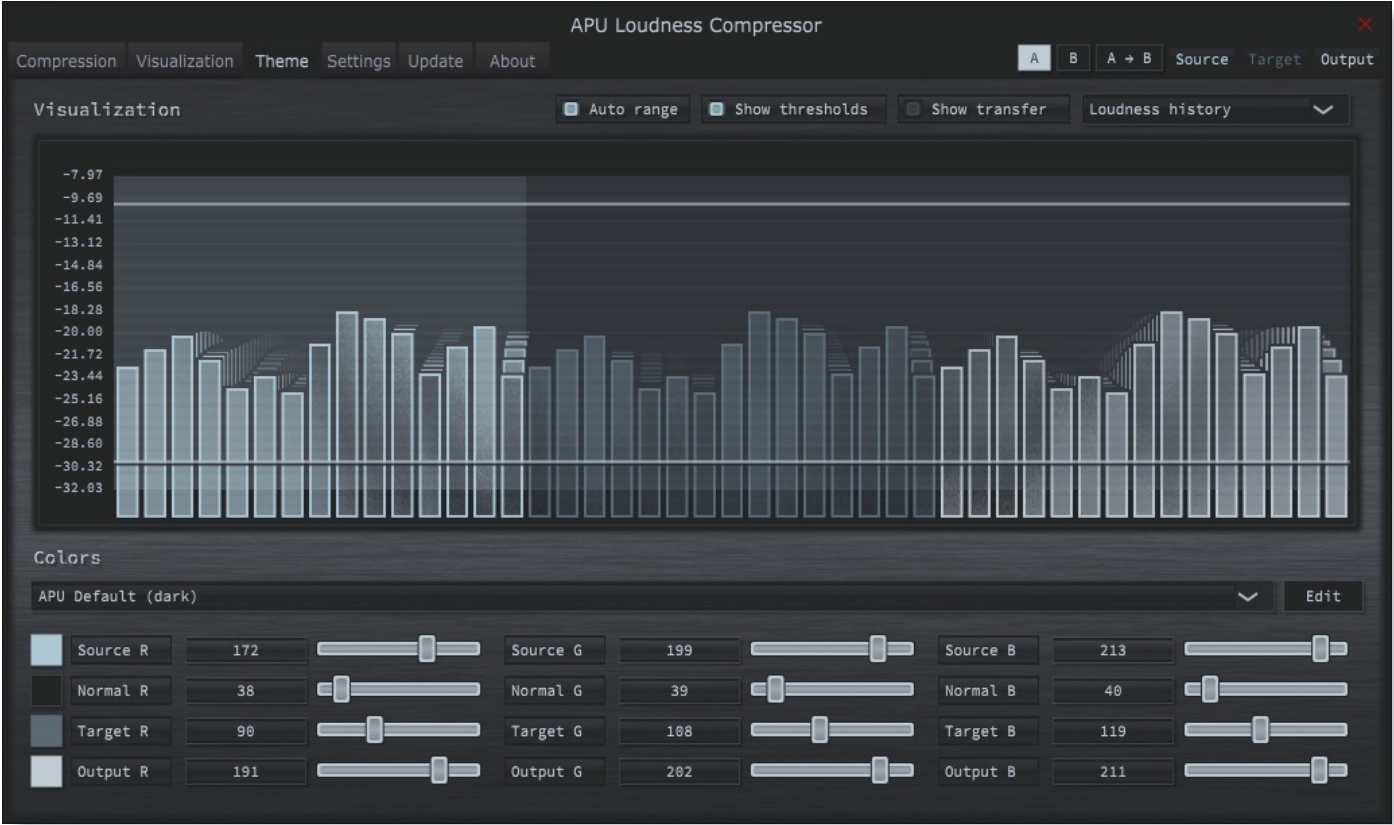
Thresholds include [source range](#), [target range](#), [threshold](#), and [knee width](#).

2.2.12. 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.

2.3. 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)
- YlOrBr (dark)
- YlOrBr (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.

### 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. 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.

### 2.4.4. Load preset ranges

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

### 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.

---

#### 2.4.6. Offline HD

The Offline HD combo-box allows you to configure the Offline HD feature. This feature, when enabled, performs super-sampling when the compressor is operated in “offline” mode. Offline mode typically applies to DAW features including Freeze and Export, but not real-time operation. The exact scenarios where this feature depends on the host application.

When enabled and active, super-sampling 2x is effectively the same as halving the block size. Likewise, 3x and 4x effectively divide the block size by 3 or 4 respectively. This has the end result of increasing the time resolution of loudness measurements. Although more loudness samples is generally better, it does come with a performance cost and so extremely low block sizes are currently only enabled for offline mode.

---

#### 2.4.7. Blocksize

The block size parameter determines the time resolution of the compressor’s [source](#) 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 compressor by tuning this setting based on your available CPU resources.

Fast attack and/or release times may benefit from similarly low block size.

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

---

#### 2.4.8. Look-ahead budget

The look-ahead budget parameter determines the latency budget which is available for the [look-ahead](#) parameter in the [compression](#) tab. Once you have configured a look-ahead budget, you can adjust the [look-ahead](#) parameter in real-time within this range without introducing artifacts.

---

#### 2.4.9. 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. Tips & Tricks

This section provides some general tips and strategies for using this compressor in a variety of contexts.

### 3.1. Compression/expansion

---

Compression is applied when the [target range](#) is smaller than the [source range](#) and the [source](#) signal is within the source range. If the [target range](#) is larger than the [source range](#), expansion is applied instead.

Signals outside of the source range have neither compressor nor expansion applied, but are amplified according to the difference between source and target min values. Manipulating the [source range](#) and/or [target range](#) allows you to compress, expand, and/or apply make-up gain.

One effective process for compressing or expanding with make-up gain is to:

- Configure your [source range](#) using the [histogram](#) and/or [history](#) visualizations for guidance
  - Target the particular range of loudness you want to compress or expand
- Configure your [target range](#) using [target range presets](#) and/or manual configuration.
  - Target the loudness range you want the [source range](#) to be mapped onto

### 3.2. Automatic gain control

---

This compressor is well suited for automatic gain control since it has support for multiple [LUFS](#) loudness types. For example, this configuration will provide very soft automatic gain control:

- Select one of the “Deep” [presets](#) which utilizes short-term LUFS loudness type
- Configure your [source range](#) so the minimum is above the noise floor and max is above the max source signal
- Configure the [target range](#) to be relatively narrow, centered at your target average loudness
- Lower the [attack/release](#) and/or [linear attack/release](#) settings as needed for transparency or responsiveness
- Fine tune [look-ahead](#) time if using a look-ahead preset

### 3.3. Gain riding

---

The compressor’s [source range](#) and [target range](#) can be dragged while maintaining range by clicking and dragging the slider area between the two range thumbs. The actual gain applied is always filtered through your attack/release settings.

## 4. Glossary

---

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

### 4.1. 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.

### 4.2. 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.



### 4.3. 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.

### 4.4. 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](#).

### 4.5. Target

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The term “target” is used throughout the plug-in to identify the “ideal” target output loudness. The actual loudness achieved depends on [attack/release](#) and [linear attack/release](#) parameter settings.

### 4.6. Output

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The term “output” is used throughout the plug-in to identify the actual output loudness. This can differ from [target](#) loudness due to non-instantaneous [attack/release](#) and/or [linear attack/release](#) parameter settings.

## 5. 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:

- Philip Dansor - Bloom (Instrumental), licensed via [Audiio](#).

