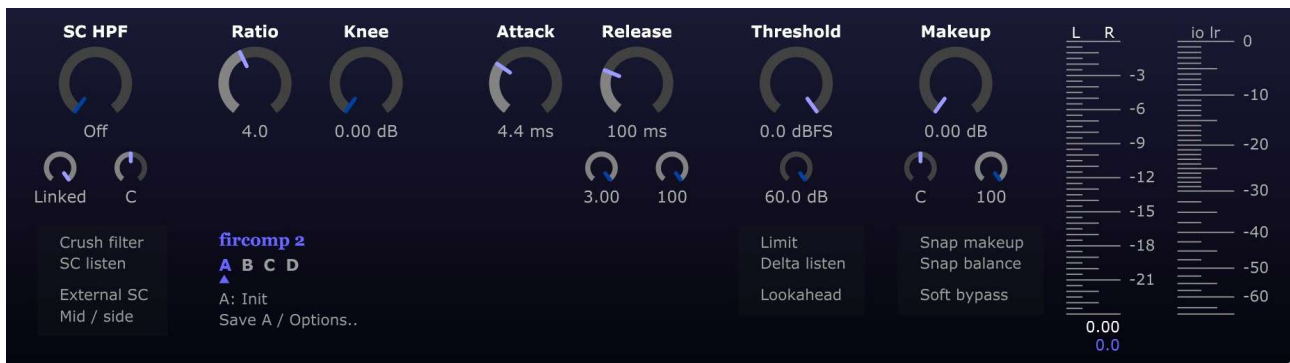


fircomp 2 user manual



Introduction

Fircomp 2 is a peak compressor / limiter which combines ideas from classic peak compressor design, alongside statistics-based methods only possible in the digital domain.

The result is a compressor which can be pushed to the extremes without falling apart, with zero / low latency, and low CPU usage. Very fast (or zero) attack times can be used without sounding "clicky". In addition, the release stage can be highly history-dependent, making Fircomp 2 suitable for busses or "invisible" compression.

There is no phase shift or filtering of the audible signal, regardless of the settings chosen. By default Fircomp 2 operates in zero latency mode, which has much lower distortion than a typical peak compressor with the same timings. But Fircomp 2 also has a "Lookahead" mode which can lower distortion even further, at the cost of a small amount of latency. The lookahead is implemented as a FIR filter applied to the gain reduction signal (not audible), along with other statistics-based methods to ensure correct timing.

Fircomp 2 vs Fircomp 1

Fircomp 2 is a new plugin that can be installed and used side-by-side with Fircomp 1. Fircomp 2 is much more flexible and has many more features.

Fircomp 2 has the same attack and release behaviour as Fircomp 1. However it cannot be made to null with Fircomp 1 due to improvements in the methods used to reduce distortion.

Features

Fircomp 2 features the same great sound and low CPU usage as Fircomp 1. This means zero or low latency, and low distortion compared to typical peak compressor designs. Plus:

Presets

- A / B / C / D buckets for settings comparison, with ability to copy / initialize buckets.
- Preset system with quick load menu based on preset folder hierarchy, with settable default preset. Presets are XML files that can be easily shared.

GUI

- Resizable vector based GUI.
- Theme system with modifiable colours, overall colour adjustments, and optional background image. Themes are XML files that can be easily modified or shared.
- Peak and LUFS-SL metering of gain reduction, dry, and compressed signals.
- Gain reduction meter with adjustable range.
- Optional big horizontal gain reduction meter.
- All GUI settings saved automatically when the window is closed.

Sidechain

- Intuitive stereo control with L/R or mid/side modes, adjustable link, detector balance, and auto makeup / makeup balance.
- Sidechain hipass filter with continuous control.
- Sidechain filter "crush" mode which adds a high shelf boost and lowers the Q of the hipass filter.
- Sidechain listen and delta listen options.
- External sidechain option.

Compression

- Ratio adjustable from 1.01 to 30, or infinity with max detection for hard limiting.
- Knee adjustable from 0 to 60 dB.
- Attack time adjustable from 0 samples to 50 ms.
- Release time adjustable from 5 ms to 3 seconds.
- Release shape control, with default matching Fircomp 1.
- Release history / program dependence control from Fircomp 1.
- Max compression range control.
- Optional lookahead mode from Fircomp 1.
- Regardless of mode, there is no phase shift or filtering of any kind applied to the audible signal.

Output

- Convenient "Limit" meta-parameter changes other settings to force limiting.
- Auto makeup and auto makeup balance "snap" controls based on past 3 seconds of perceived loudness.
- Soft bypass control which preserves latency.
- Wet / dry mix control.

Formats

Fircomp 2 supports the following platforms / formats:

- 64-bit AU for Intel-based macs
- 64-bit VST3 for Intel-based macs
- 64-bit VST3 for Intel-based Windows PCs

Other formats are planned in future. Please ensure Fircomp 2 works correctly on your system **before** purchasing.

At the time of writing this manual, the Intel x64 version of Fircomp 2 appears to work on M1 macs, but is **not officially supported**.

Sample rate support

Fircomp officially supports the following sample rates: 44.1 , 48, 88.2, 96, 176.4, and 192 kHz. Sample rates higher than 192 kHz will degrade the sound quality. Non-supported sample rates below 192 kHz may work, but are not officially supported and lookahead may behave unexpectedly. If using a host that allows you to oversample a plugin, restrict oversampling to a multiplier that does not exceed the maximum sample rate of 192 kHz.

Installation

Installation simply involves downloading and unzipping the correct file, then copying the plugin file/bundle into the correct folder/directory for your system. Depending on your DAW or host software, you may then need to "rescan" your plugin folder. The folders/directories suggested below are the defaults for most systems, but you may have a different preferred location.

Windows VST3: Copy the `FirComp2.vst3` file to the `C:\Program Files\Common Files\VST3` folder.

Mac OSX VST3: Copy the `FirComp2.vst3` file to the `/Library/Audio/Plug-Ins/VST3` folder. If this folder is not visible, from the finder you can click on `Go -> Go to folder` to navigate to it.

Mac OSX AU2: Copy the `FirComp2.component` file to the `/Library/Audio/Plug-Ins/Components` folder. If this folder is not visible, from the finder you can click on `Go -> Go to folder` to navigate to it.

OSX "unquarantine" command file

The `fircomp2_unquarantine.command` file included with the OSX versions of the plugin is designed to be run before copying the plugin files(s) to the system folders (listed above). It simply removes the "quarantine" attribute from the downloaded

plugin files, and has no other effect on your system. It does this using the `xattr` program included with OSX. To close Terminal after this process has completed, simply go to `Terminal -> Quit Terminal`, or press `Cmd-Q` while the terminal window is selected.

Support / feedback / bugs

Please send support requests / feedback / bug reports to: fircomp@jonvaudio.com

If asking for support or help, please provide:

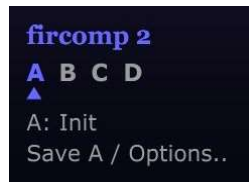
- The exact operating system version(s)
- The exact DAW versions(s)
- The exact Fircomp 2 version

If at all possible, videos or screenshots demonstrating your issue can also be very helpful.

Controls

The buckets, quickload, and save / options menus

Fircomp 2 has four popup menus, and this section describes three of them. The popup menu that appears when clicking on a meter is described in the "Meters" section below.



Buckets, and bucket popup menu

Fircomp 2 can remember 4 different sets of settings, so that you can easily compare different compression settings or amounts. These are labelled A, B, C, and D, and you can switch between them by clicking on them. However, clicking on the currently active bucket shows the bucket popup menu, with the following options:

- Init ALL: Initialize all buckets to the default bucket (either the user-saved default preset, or the hard coded defaults if no default preset file exists).
- Init [current bucket]: Initializes just the currently selected bucket
- Copy [current bucket] to ALL: copies the current bucket's settings to all other buckets.
- Copy [current bucket] to [other bucket]: Copies settings from the current bucket to one other bucket.

[Current bucket]: [preset name] (quick load preset popup menu)

Clicking on the currently loaded preset name, or "Init" if no preset has been loaded, shows the "quick load" preset popup menu. This allows you to quickly load a preset

into the **current bucket only**. All other buckets will be unaffected.

The structure of this popup menu mirrors the directory structure of the presets folder, but is limited to 5 levels deep and 100 entries per level. The presets folder can be revealed in Windows Explorer or the Finder on OSX by using the "Save [current bucket] / Options.. -> Browse settings/presets/themes.." option (described below).

Save [current bucket] / Options.. popup menu

- Save [current bucket] to preset file..: Saves **only** the current bucket as a preset. The preset file can be saved anywhere, but it is recommended that you save it in the presets folder if you want to access it from the quick load preset menu.
- Load [current bucket] from preset file..: Works exactly the same as the quick load preset menu, but allows you to browse for any file on your computer.
- Save [current bucket] as default preset: Saves the current bucket as the default preset for when the plugin is loaded or buckets are initialized. (If no default preset exists when initializing, hard coded defaults are used). To delete your default preset, delete the `fircomp2_init_preset.xml` file from the settings folder (see below on how to access the settings folder).
- Themes ([theme name]): Load a visual theme from the themes folder. Themes are stored as `.xml` files, open them in your favourite text editor to modify them or create themes of your own. The factory themes are commented with instructions on how to make new themes.
- Install factory presets:
Install factory themes: These two options allow you to re-install factory presets and themes. **Warning:** any existing presets or themes with the same file names will be overwritten, but any presets or themes with differing file names in the same folder(s) will be left in place.
- Visit jonvaudio.com..: Launches your default web browser.
- Version / info..: Shows a popup dialog box with information on the current version of Fircomp 2.

Using rotary controls

Vertical mouse drag: Adjust value.

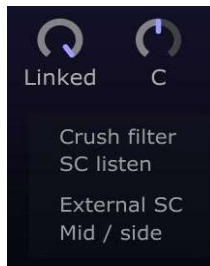
Double click: Reset to hard-coded default value.

Ctrl+vertical mouse drag: Fine adjust value.

Click on text below: Type in a new value.

The stereo controls

Internally, Fircomp2 is a dual mono compressor. Gain reduction is linked or unlinked "on the way in" at the detection stage, instead of at the gain reduction stage. This is a design choice for a nice stereo image. The stereo controls are discussed together here, as they all relate to each other.



Mid / side

This button enables the mid / side mode. An explanation of mid / side processing is beyond the scope of this manual. When this is disabled, Fircomp 2 operates as a standard left / right compressor. When Mid / side is enabled, Fircomp 2 handles all the details of mid side processing for you, including encoding and decoding. The input, output, and gain reduction meters will also be switched to mid / side mode. But you should still feed Fircomp 2 with a left / right input signal and it will give you a left / right output signal.

SC Link % (bottom left of SC HPF)

This controls the percentage of left / right (or mid / side) detector linking post-rectification (how much they are "fed into" each other). At "Unlinked" (0%) Fircomp 2 behaves like a dual mono compressor. At "Linked" (100%) Fircomp 2 behaves like a standard stereo compressor with a mono sidechain.

Text entry shortcuts: l, m, r, s, c for left / mid, right / side, or center.

SC balance (bottom right of SC HPF)

This effectively allows you to set a different threshold for the left / right (or mid / side) channels, by panning the input. In left / right mode, turning this control to the left reduces the amount of compression applied to the right channel, and vice versa. When set all the way to the left or right, compression is only applied to one of the channels, with the other channel left untouched. **However...**

SC balance can intelligently override SC Link %

Let's say you set SC Link % to Linked (100%), but then adjust the SC balance slightly to the left. You will notice the appearance of the SC Link control change. This is because, although the amount of L being fed into the R detector stays the same, the amount of R being fed into the L detector has been overridden slightly. Sound confusing? Don't worry about it - it has all been configured to "just work" while preserving the amount of gain reduction.



MU balance (makeup balance, bottom left of makeup control)

Placed beneath the makeup control, which is explained below. But we introduce MU balance here as it relates to the stereo system. It's a pan control, but **only for the additional gain added by the "Makeup" control**. If there is no makeup gain added, MU balance has no effect. This is an intentional design decision, which allows the perceived gain reduction metering to estimate the output balance of the makeup gain.

The displayed angular meter position for MU balance is Fircomp 2's estimation, based on the perceived loudness of the gain reduction (more on that below). It aims to preserve the same balance as the input signal.

Text entry shortcuts: *l, m, r, s, c* for left / mid, right / side, or center.

Simplified step-by-step process for Fircomp 2's stereo system:

- 1)** Choose Mid / side if you want mid side processing, or leave off for standard left / right processing, then
- 2)** Decide on stereo link amount, then
- 3)** Listen to see if one channel should be compressed more than the other, and set SC balance accordingly. Or set to min/max if you only want to compress one channel, then
- 4)** Set MU balance accordingly if you need makeup gain, using the estimation meter or your own ears. If you are only compressing one channel, then also set MU balance to min/max.

Compression controls

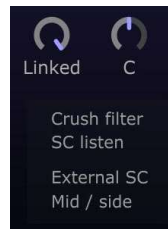


SC HPF

This controls the cutoff frequency of the hipass filter in the sidechain. For those not familiar with sidechain filtering: this filter is **not** applied to the audible signal, and since Fircomp 2 is a wideband compressor, it does **not** affect the frequency response of the output either. It simply filters the signal that Fircomp 2 *responds* to.

The "Off" setting is a true bypass, needed for limiting.

Text entry shortcuts: n for "natural", h for "de-harsh", s for "de-ess", using values from Fircomp 1. k for 38 Hz. Entering a value smaller than 10 will give kHz, eg 7 gives 7 kHz.



Crush filter

When this control is disabled, the sidechain hipass filter behaves in the same way as Fircomp 1: a 12 dB / octave butterworth hipass filter.

When the crush filter control is enabled, an additional hi mid shelf boost is applied, and the Q of the hipass filter is reduced to 0.5. If SC HPF is set to "Off", the crush filter control has no effect.

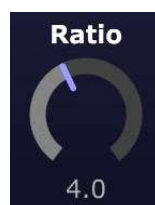
The crush filter is named as it "crushes" the perceived volume of a source, keeping its volume the same. However it is usually not needed, and it can make the compressor behave aggressively. When combined with the SC HPF set to 38 Hz, the overall sidechain filtering is almost the same as the k-weighted filtering used for the perceived loudness filters. (38 Hz might seem low, but with the gentler Q, the HPF starts to roll off at a much higher frequency).

SC listen

This allows you to preview the the sidechain filtering applied to the dry signal, but **without** mid/side encoding or detector link / balance parameters, makeup etc. If you enable "Delta listen" (see below) this control will be disabled, and vice versa.

External SC

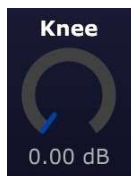
Allows you to trigger the compressor with an external sidechain signal. Note that this will have no effect if no external sidechain signal is routed into Fircomp 2 in your DAW! The external sidechain signal **will** also be routed through the sidechain filtering, mid side encoding, linking, and balancing.



Ratio

This is a standard compression ratio control from 1.01 to 30, or Infinity. However, ratio also affects the detection mode. When set to "Infinity", the detector takes the max of the two input channels when linked. When set to any other ratio, the detector

takes the average of the input channels when linked. But don't worry - you don't need to think about this, and the "Limit" meta parameter will let you know if you are limiting or not.



Knee

This is a standard compressor knee control, from 0.0 dB (no knee whatsoever) up to an extremely soft 60 dB. The knee extends half above, and half below, the threshold, eg a threshold of -20 dBFS and a knee of 10 dB means that compression can start on signals that reach -25 dBFS.



Attack

This is a standard attack time constant control, extending from 0 samples (true zero / same-sample attack time) to 50 ms. The attack ballistics are the same as Fircomp 1, and are capable of being extremely fast with high levels of compression without sounding "clicky".

Release

This is an overall release time constant control, extending from 5 ms up to 3 seconds. The actual release behaviour is also influenced by the R Shape and Prog dep % controls. The release ballistics are the same as Fircomp 1 (except for the additional shape control). Values smaller than 4 are interpreted as seconds when typed into the text entry box (eg 2.5 gives 2.5 seconds).

R Shape (release shape, bottom left of release)

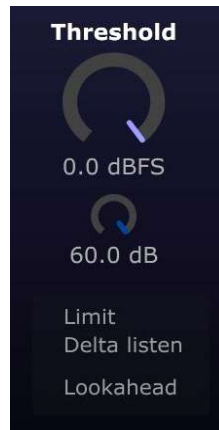
The release stage of Fircomp 2 is a release-to-target design, but the R Shape control allows you to speed up the beginning of the release stage. The default (and Fircomp 1 behaviour) is 3.0, which means that the beginning of the release stage can be 3x faster, but then becomes unboundedly slow as it reaches its target. The minimum value is 1.0, which means that the beginning of the release stage is much more linear, but still slows down as it reaches its target.

Musically, higher numbers mean more background detail is brought up, and lower numbers mean more pumping or "noticeable" compression.

Prog dep % (release program/history dependence %, bottom right of release)

This is identical to the control from Fircomp 1. At 100%, the release time constants are recalculated every audio sample depending on the recent history of 3x the release time. At "PD Off" (0%), the release stage is still "program dependent" under the classic definition, but only depends on the current instantaneous gain reduction (which itself depends on history...) vs the current target gain.

At 100%, Fircomp 2 is very transparent, especially if R Shape is set to 3.0. But at this setting the release time control may not have enough of an influence and you may want less transparency.



Threshold

This is a standard compression threshold control in dBFS. The threshold rotary control also displays an angular peak meter for convenience. This peak meter is **not** the same as the input peak meter on the right hand side. It displays the max value of both sidechain channels, post-SC filtering and linking. If the sidechain is external, it will show this external SC signal (again, post filtering and linking).

Max compr (max compression)

This control limits the amount of gain reduction that takes place. The angular peak meter shows the maximum of both channels' gain reduction currently taking place. Note that this does **not** "scale" the gain reduction, it is simply a hard cap. (If you are looking to scale the gain reduction, use the Wet % control instead).

Limit (meta-control)

This is not a parameter in its own right. Enabling it changes other Fircomp 2 parameters to force Fircomp 2 into becoming a hard limiter. If you change the other settings yourself, the Limit button will become enabled to indicate that you are limiting. In addition, once clicked, it can be clicked again to return to last known non-limiting parameters, but these are forgotten as soon as you start making your own adjustments again.

Note: Fircomp 2 does **not** use a true peak detector, as it is primarily designed to run very efficiently on tracks and busses. While it does ensure that no audio samples at

the current sample rate will exceed the threshold while limiting, it does **not** guarantee the same of intersample peaks. Therefore, if using Fircomp 2 on the master, it is recommended to follow up with a limiter that does detect intersample peaks.

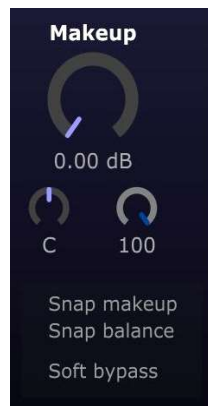
Delta listen

This allows you to listen to the difference between the dry and compressed (before makeup / MU balance) signals. Useful for de-essing etc.

If you enable "SC listen" this control will be disabled. If you are in mid / side mode, the delta you hear will still give you the difference between dry L/R and compressed L/R after mid/side compression has taken place.

Lookahead

This enables the lookahead, which has the same lookahead implementation as Fircomp 1. This incurs a small amount of latency which is reported to your host. See the introduction section for how lookahead works. For most situations it is not necessary - enable it when you start to hear any distortion that you don't like.



Makeup

This is the makeup gain control in dB. It is only applied to the compressed signal - the dry signal (when using dry / wet mix) is not affected by makeup gain. The angular meter shows the max of the two channels' perceived loudness gain reduction estimation, which is the value that corresponds to the MU Balance suggested value. Note that if you are using very short attack times, this estimate may be too high. You should always check by toggling the "Soft bypass" button.

Wet % (bottom right of makeup gain)

The default of 100% gives you the compressed signal, as you would expect. Turning this down allows you to mix in some of the dry signal. A common use case involves over-compressing by an extreme amount, applying makeup so that the dry and compressed signals have the same perceived loudness, and then only mixing in a small amount of the wet signal. Makeup gain & balance have no effect on the dry signal.

Snap makeup

This snaps the makeup gain to the perceived gain reduction amount. As the perceived gain reduction is measured over the past 3 seconds, simply wait for everything to "stabilize" then click on this for a convenient auto gain function. As always, this is just an estimate and you should use "soft bypass" to check level matching with your ears.

Snap balance

As with "snap makeup", but snaps makeup balance instead.

Soft bypass

This bypasses the whole plugin, but preserves the same latency (if lookahead is enabled) and still shows the gain reduction meters (ie, the compression algorithm is still running, but bypassed).



Meters and meters popup menu

By default, Fircomp 2 shows a vertical gain reduction meter, alongside dry and compressed-plus-makeup meters. The meter types are peak, peak hold, and k-weighted LUFS-SL. The meter calculations are carried out in the audio / dsp thread, but are disabled when the GUI is closed. Therefore, when the GUI is open, your DAW's CPU / DSP meter will show slightly higher usage for the current instance, even though DAW CPU / DSP meters do not show GUI CPU use.

The "io lr" or "io ms" meters show the dry signal on the left hand side, and the compressed-plus-makeup signal on the right hand side. In mid / side mode, these are mid / side meters. This has the advantage of allowing you to match input and output levels, but the slight disadvantage of not being able to see standard left & right output levels in mid / side mode. The peak value readouts (same colour as peak bar in your theme) show max(L, R) or max (mid, side) for either input or output, depending on the menu setting (see below). The LUFS-SL readouts show average(L, R) or average(mid, side) for either input or output, depending on the menu setting. The output levels are calculated using the compressed signal before makeup gain is applied, but then makeup gain and makeup balance are added instantly to the result, so that these calculations can then be reused for perceived gain reduction.

The gain reduction meter shows the peak gain reduction amounts, alongside the perceived gain reduction amounts calculated using the values from the input & output meters. The perceived gain reduction amount meter may sometimes wobble, as it measures the difference between two longer-running average levels which become less meaningful as the input signal starts to decrease in volume. It is **not** a reflection of the actual gain reduction (shown by the peak meters), but aids in suggesting makeup gain amounts. The gain reduction meter also follows the mid/side mode. Both the peak and perceived gain reduction readouts display max(L, R) or max(mid, side).

Clicking on any meters brings up the **meter popup menu**:

- Big GR meter / Small GR meter: Toggle between the standard vertical gain reduction meter, and the big horizontal gain reduction meter. When the big horizontal gain reduction meter is enabled, the vertical gain reduction meter is hidden and the dry and compressed+makeup meters take their place.
- GR right to left / GR left to right: By default, when the horizontal gain reduction meter is enabled, the meter travels from right to left. This setting allows you to reverse that direction.
- Range: Set the range of the gain reduction meter in either mode.
- Input level readouts / Output level readouts: Changes the readouts from the bottom of the input / output meters to either come from the input (dry) levels, or the output (compressed-plus-makeup) levels.

Thanks and acknowledgement

Fircomp 2 uses the juce framework for the GUI and cross platform support:

<https://juce.com/>

VST is a registered trademark of Steinberg Media Technologies GmbH.

Beta testers (in no particular order);

bManic

SolidTrax

BitFunk - Twitter @BitFunk

Rojh

Nantho

Nil

Vas

Lesha

Kirke

David

Heath

Richard

...plus thanks to everyone else who gave valuable feedback on Fircomp v1!