



NEUTRON

USER GUIDE



Copyright © 2016 iZotope, Inc. All rights reserved



CONTENTS

USER GUIDE	1	UNDERSTANDING NEUTRON'S TRANSIENT SHAPER	45
WHAT IS NEUTRON?	3	WHAT IS A TRANSIENT SHAPER?	45
DESIGN PHILOSOPHY	4	TRANSIENT SHAPER FEATURES	45
SIGNAL FLOW	5	UNDERSTANDING THE LIMITER	50
MEET YOUR NEW TRACK ASSISTANT!	7	NAVIGATING THE LIMITER	50
WHAT IS TRACK ASSISTANT?	7	LIMITER FEATURES	50
HOW DOES TRACK ASSISTANT WORK?	8	GENERAL FUNCTIONS	53
TRACK ASSISTANT FEATURES	10	SURROUND SOUND	53
UNDERSTANDING THE MASKING METER	12	USING THE PRESET MANAGER	54
WHAT IS MASKING?	12	OPTIONS MENU	56
HOW DOES NEUTRON MEASURE PROBLEMATIC MASKING?	13	AUTHORIZATION	65
MASKING METER FEATURES	14	AUTHORIZING YOUR COPY OF NEUTRON ONLINE	66
UNDERSTANDING NEUTRINO SPECTRAL SHAPING	19	AUTHORIZING YOUR COPY OF NEUTRON OFFLINE	67
WHAT IS SPECTRAL SHAPING?	19	ILOK SUPPORT	68
NEUTRINO SPECTRAL SHAPING FEATURES	20	REMOVING YOUR CURRENT AUTHORIZATION	69
UNDERSTANDING THE EQUALIZER	22	HOW TO CONTACT IZOTOPE CUSTOMER CARE	69
WHAT IS AN EQUALIZER?	22	IZOTOPE CUSTOMER CARE	70
EQ FEATURES	24	HOW TO PURCHASE THE FULL VERSION	70
UNDERSTANDING THE COMPRESSOR	32	IZOTOPE CUSTOMER CARE POLICY	70
WHAT IS A COMPRESSOR?	32	HOW TO CONTACT IZOTOPE CUSTOMER CARE FOR TECHNICAL SUPPORT	70
COMPRESSOR FEATURES	33	INTERNATIONAL DISTRIBUTION	71
UNDERSTANDING THE EXCITER	40	END USER LICENSE AGREEMENT	72
WHAT IS AN EXCITER?	40		
EXCITER FEATURES	41		



WHAT IS NEUTRON?



Overview

Neutron is a powerful mixing plug-in which combines the latest innovations in analysis and metering with award-winning audio processing.

With powerful new features like Track Assistant and Masking Meter, Neutron helps you quickly reach an optimal starting point, clearly identify perceptual frequency collisions, and fully wield creative control over all of your mix decisions.





There are three flavors of Neutron:

1. **Neutrino**, a free spectral shaping subset of the greater Neutron feature set.
2. **Neutron**, a channel strip that features five modules, seven processors, Track Assistant, and Masking Meter.
3. **Neutron Advanced**, which includes Neutron as well as four additional dedicated component plug-ins (EQ, Compressor, Exciter, and Transient Shaper), as well as support for surround sound.

Design philosophy

iZotopians are a dedicated, passionate crew of musicians, producers, and performers. Neutron's driving force was our passion for one of recorded audio's most underappreciated, yet arguably most important art form...the art of the mix.

Many of us spend countless hours, day and night, in our project studios, or the listening rooms at iZotope HQ mixing all manner of audio...a diverse array of music and post productions, from mono right up to immersive surround sound. Since we don't possess any godlike super-audio-mixing-powers (spoiler alert: no one does, it's just practice, practice, practice*), we too enjoy the pursuit of a refined, well-balanced mix.

Though it contains a wealth of analog/vintage and digital processing, Neutron is not intended to simply be a nostalgic restatement of legacy mix tools...it pays homage to that, but with thought to the rest of the art of mixing. Neutron is designed to address those issues of refinement, subtlety, and balance that are so crucial to achieving a good mix.

Neutron offers tools that hopefully increase both the enjoyment and practicality factors of your mix process. Though there are more obvious examples of this design philosophy, such as the Masking Meter that smartly and precisely informs you of any perceptual frequency collision to guide EQ decisions across tracks, there are also many subtle tweaks worth highlighting:

- The EQ's Learn feature, which analyzes a signal and places nodes on areas of interest (such as fundamentals, resonances, sibilances, build-ups, and more), is incredibly useful as a subtractive EQ tool, to quickly locate problem areas in a signal.
- The flexible internal and external sidechain options in the Dynamic EQ, which help audio tracks interact with each other across a whole mix.
- The Neutrino spectral shaping algorithm, which seeks to smooth out resonances and harshness in a track, and the subtle benefits of which are heard more extensively the more it's enabled across a mix.

- The Dry/Wet Mix parameters in the signal flow transform each module into a parallel processing powerhouse, so that even when processing more heavily, you can blend in the perfect amount of Dry, unaffected signal. This is particularly neat on the EQ and the Transient Shaper, where parallel processing is less used than it may be in a Compressor.

We certainly hope you enjoy using Neutron in your quest for a better sounding mix!

*(*and more practice.)*

Signal flow



Both Neutron and Neutron Advanced contain a channel-strip plug-in with three main areas:

1. The menu bar, in which Track Assistant, Preset Browser, and other functions are found.
2. The I/O panel, in which some useful global functionality such as Zero Latency and Bypass is found.
3. The module specific view, to the left of the I/O panel, and below the menu bar, in which all parameters associated with that module are available for use.



The Neutron channel-strip's signal flow is as follows. With the exception of Input and Output Gain, all other processing can be bypassed if unwanted to save both CPU and latency (when in True Bypass mode, an option in the Options menu/General).

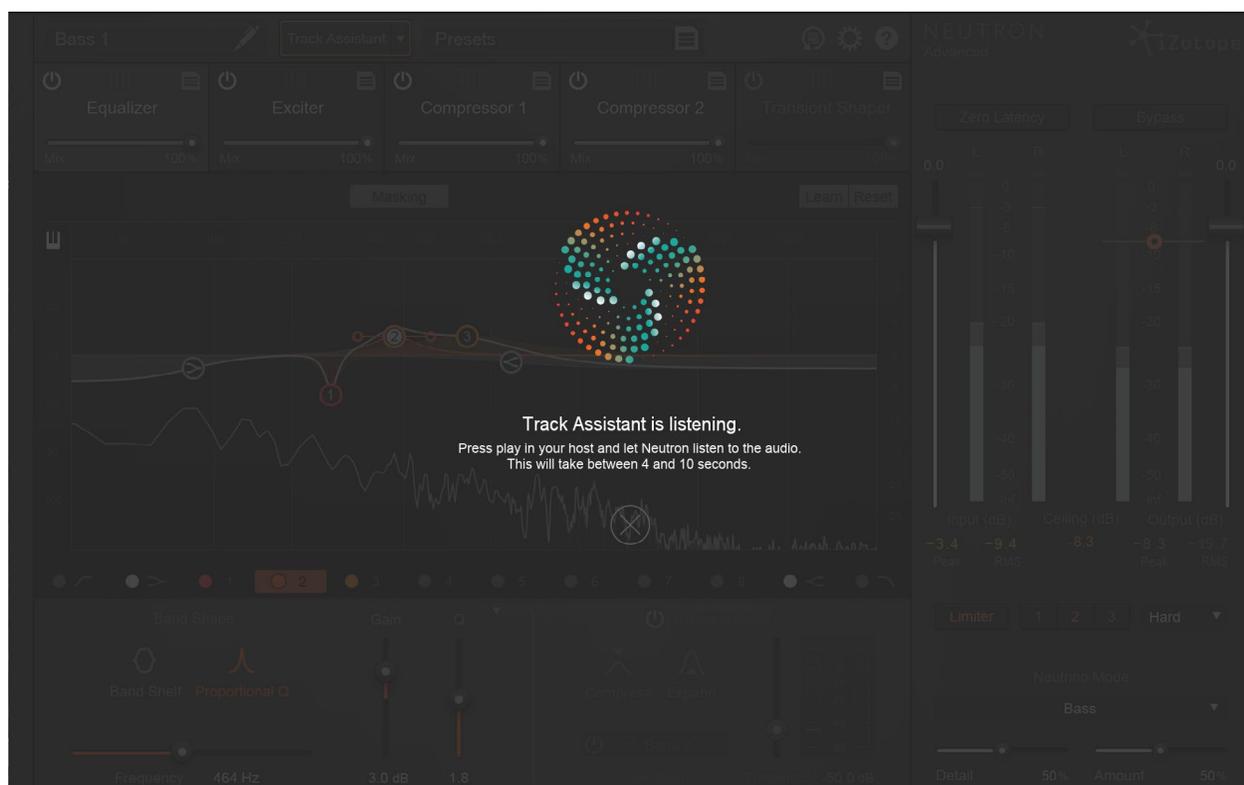
1. Input Gain
2. Module 1
3. Module 2
4. Module 3
5. Module 4
6. Module 5
7. Neutrino spectral shaping
8. Output Gain
9. Limiter

You may click to drag and reorder any one of the five modules in the signal flow. Though EQ is often first or early in the chain, there's no one-size-fits-all signal flow. If you're using Track Assistant for instance, you'll notice it engages some different default signal flows depending on the audio it identifies. Neutron also contains hundreds of presets, each of which may have a unique signal flow.

Above all, check your signal flow before you wreck your signal flow—if it sounds good, it most likely is good.



MEET YOUR NEW TRACK ASSISTANT!



What is Track Assistant?

Here at iZotope, we're firm believers in presets—not as the be-all, end-all of the art of mixing by any means—but as an inspirational or a practical starting point to quickly audition new sounds or new techniques and ultimately broaden mix horizons. Indeed, some users make occasional use of presets while others rely on them all the time for different reasons. Track Assistant is a new level of audio intelligence, designed to provide a fresh take on the philosophy of the preset-based approach, with you, the Mix Engineer, firmly in control.





At the touch of the appropriately named Track Assistant button, Neutron will listen to the audio input, determine its key characteristics, and deliver a new preset that's custom tuned to your audio in a variety of ways. Track Assistant is designed to suggest custom-tuned preset settings as a creative starting point, which you can tweak to taste, or reject. Track Assistant's goal is not only to “do no harm”, but in fact to deliver a good-sounding, intelligent starting point that you can then take to the next level with everything else Neutron has to offer.

How does Track Assistant work?

When Track Assistant is enabled, it requires anywhere between four to 10 seconds of audio playback and analysis before it settles on some settings. Unfortunately, this is too quick for you to take a break with a freshly brewed cup of coffee, tea, or something stronger—it's not that kind of assistant.

It's a combination of audio intelligence producing unique settings every time (some settings on your drum bus, for example, might be very different to settings on someone else's drum bus) mixed with smart templates, using somewhat repeatable best practices. The audio intelligence utilizes some machine learning techniques, but it doesn't require online communication with the cloud, so you don't have to worry about any big brother-esque, 1984-style shenanigans. (That said, MIDI was released in 1984, so it wasn't such a bad year...)

Since you may prefer heavier or lighter starting settings, you have some level of control over the smart suggestions. You can decide if you'd prefer your Track Assistant to be Subtle, Medium, or Aggressive, in addition to a second, more subjective instructional direction, which could be Broadband Clarity, Warm and Open, or Upfront Midrange. These mode choices affect the amount of processing (less vs. more processing), number of bands, and compression ratios, among other parameters. To access these settings, click the triangle next to Track Assistant.

These nine different mode combinations (three types with three presets each) influence the starting points that Track Assistant will provide. Since each of these nine mode combinations has five smart templates—one per audio ID type, explained below—under the hood, there's a total of 45 unique and varied initial approaches. Note that Track Assistant requires a learning state, during which Neutron is inaccessible. (It will automatically time-out once it's done, but in case of error or impatience, you may cancel the analysis by clicking the X.) Here's what's going on under the hood:

1. The machine learning algorithm identifies your audio as belonging to one of the following categories:
 - Vocals/Dialogue
 - Guitar/related Instrument
 - Bass
 - Drums/Percussive
 - None of the above (e.g. Synths, Didgeridoo, Vuvuzela)

- 
2. The 'Neutrino mode' spectral shaping algorithm for that category is selected and enabled. Note: If the audio is identified as 'none of the above,' it will select a 'Clean' Neutrino mode, which bypasses Neutrino.
 3. Using the audio identification information, it references the smart templates to determine an appropriate signal flow. Signal flows are predefined by some of the esteemed mix engineers in our beta program, and may vary in module order, or in modules enabled/disabled.
 4. Once signal flow is established, the smart templates determine how many bands each discrete multiband-capable module should have (minimum of one, maximum of three).
 5. For each enabled multiband module, band crossover points are intelligently placed. The most transparent crossover points are determined using a few criteria, including minima in the spectrum. You may see and hear these bands moving during this crossover learning period.
 6. In the EQ module, a basic starting curve is determined, by enabling some filter nodes and intelligently placing those nodes throughout the audio spectrum on areas of interest (resonances, sibilance...all specific and unique to your audio). Depending on where these EQ nodes land, they may exhibit small boosts, cuts, static or dynamic behavior, or bell or shelving filter choices.
 - More information on this auto-node placement behavior is available in the EQ chapter. It is important to note that Track Assistant does not analyze the audio in order to meet some sort of pre-defined outcome (e.g. if the audio has no low end, it's not going to engage a huge low end boost for the sake of making it more like pink noise); rather, it places nodes at areas of interest already present in the signal.
 7. If the Exciter is enabled, the smart templates are used to set per-band Exciter parameters such as Drive, algorithm (on the Tube/Tape/Warm/Retro X/Y pad), and Dry/Wet Blend.
 8. For each enabled Compressor band, as well as each enabled dynamic EQ band, thresholds are dynamically chosen, based on an LKFS signal level analysis and an additional calculation. (This means less time searching for the sweet spot, and more time slightly tweaking the sweet spot if you feel it could be slightly sweeter, or aesthetically wish to go in another direction.)
 9. If either or both of the Compressors are enabled, the smart templates determine stylistically whether it should engage Vintage- or Digital-flavored compression modes, and also dial in Ratio, Attack, Release, and Dry/Wet settings.

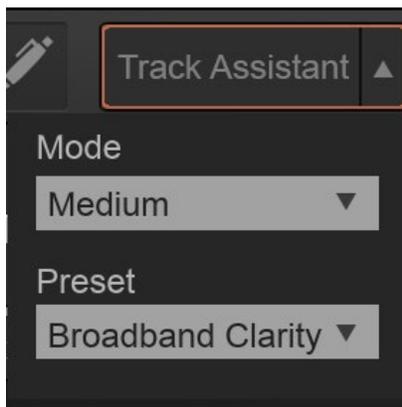
Once Track Assistant has finished running, you have your starting preset: signal flow, EQ curve with placed nodes, Compression, Exciting, and Neutrino settings.

If this reads like a sequence of events, it isn't. Step 1 and 2 happen first, but subsequent to that, these are all decisions being made not consecutively in series, but all at once, and all in relation to one another, to produce the final output.

SOME THINGS IMPORTANT TO NOTE:

- If the audio is not one of the categories, and tagged as 'Clean' by the Neutrino mode, Neutron will still create a preset, as much of the intelligence can operate agnostic of audio type, and even the smart templates have some genericized best-practice approaches built in for this purpose.
- The Transient Shaper and its new algorithms sound fantastic, but are not adjusted by Track Assistant at this time, which will disable it.
- If Track Assistant misidentifies your audio file, please send it to iZotope via the Customer Care team (<https://support.izotope.com/>), who will be happy to pass it on, helping us improve the algorithms for you. (Of course, that goes for any feedback, at any time!)

Track Assistant Features



Track Assistant type

- Subtle will use fewer EQ nodes, and gentler Compression and Exciter settings.
- Medium is the base level of gentle, “do-no-harm” settings you may wish to then build off of.
- Aggressive will actively seek more areas of interest in the frequency spectrum and add heavier Compression settings.

Track Assistant presets

1. Broadband Clarity is mostly reductive in order to deal with mud and upward masking. It incorporates some gentle wide Q EQ boosts depending on the aggression setting chosen by the user. Compression is often clean and transparent.

- 
2. Warm and Open is focused on adding body and punch to every instrument. Compression will become heavier as the user chooses a higher aggression setting. EQ boosts the lower midrange for those times when an instrument is lacking the definition that it needs. Depending on the content, Track Assist may also choose to add some boosts to the midrange in order to bring out the tracks character and detail.
 3. Upfront Midrange focuses on midrange and 'air' EQ boosts. Most are wide Q and are designed to be musical. Removes any potential mud that may be masking the midrange from shining and sitting in front of the mix. Utilizes parallel compression to add an edge to your track.

Undo History

If you're unsatisfied with Track Assistant, it's very simple to step back in time...simply open Undo History, and click back to the prior step in the Undo History stack.



UNDERSTANDING THE MASKING METER

Neutron's Masking Meter is designed to allow you to quickly and easily see where any tracks in your mix may be competing with one another, potentially contributing to a lack of headroom, a muddy sound, or other subjective (and often negative!) terms that ultimately boil down to one word...masking. Skip to the bottom for specific instruction on the parameters of the Masking Meter, but before we get ahead of ourselves...

What is Masking?

Masking is a psychoacoustic phenomenon that occurs when clear perception of a sound source is rendered harder to discern by another sound source with overlapping temporal and/or spectral components. You may well have experienced this when attempting to balance a kick drum and a bass guitar together, or perhaps a vocal with a rhythm guitar...and finding it hard to carve out the right sonic space for each element to sound impactful and discernible without becoming inaudible.

In general, masking is not necessarily a bad thing: any time two sources "blend" there is likely some overlap in frequency range, and therefore some amount of masking taking place. For instance, we'd be willing to bet the famous wall-of-sound technique pioneered during the 1960s demonstrated all sorts of "good" masking. That said, problematic masking is the bane of mix engineers everywhere, as they try and listen, analyze, and understand where tracks compete across an entire mix.

The reduction of auditory masking is a crucial objective when mixing multitrack audio, and often what separates a good mix from a bad mix. We know this pain, but the answer is not always gain...indeed, it is typically achieved through manipulation of gain, equalization, and/or panning for each stem in a mix.





For instance, it's good practice to start a mix in mono, and establish a good healthy volume and spectral balance between tracks before subsequently panning tracks around the stereo/surround image. In this scenario, you would use a Masking Meter and EQ prior to panning, but be aware that it's also possible to resolve audible masking issues by panning one source one direction, and another source the other direction.

In order to establish an idea of what problematic masking might be, and subsequently how to visualize potential problem areas for you to consider when EQ'ing, Neutron uses a proprietary psychoacoustic masking hypothesis and approach developed by some dedicated iZotopians. This hypothesis was accepted as a convention research paper by the Audio Engineering Society in September of 2016 (AES 141, Paper 53). Our meter shows you, in real time, areas of the frequency spectrum where masking is occurring (the Masking Meter) and where masking amounts are particularly high (the Masking Histogram), alerting you to frequency regions that are potentially worthy of attention.

How does Neutron measure problematic Masking?

There are more extensive details in the AES paper, but in essence, Neutron bases its analysis on a measure called loudness loss: the difference between how loud a track sounds when solo'd ("perceived loudness") and how loud it sounds in the presence of another track ("perceived partial loudness"). Simply put, Neutron takes two audio inputs—a source (the plug-in) and an external input "masker" (the plug-in selected in the Masking Meter drop-down menu)—and uses a model of the outer/middle ear to calculate perceptual loudness of each, as well as their loudness relative to one another. The source's loudness loss due to the masker is then calculated as:

Loudness Loss =

Perceived loudness [phons] - Perceived partial loudness [phons]

The units used in this calculation are phons, a decibel-like unit of perceived loudness: The measure of any given sound in phons correlates to the dB SPL of a pure tone at 1 kHz that sounds equally as loud to the listener. As such, this loudness loss measurement is frequency specific in order to compensate for the effect of frequency on the perceived loudness of tones, a behavior which changes throughout the spectrum due to the intricacies of human hearing.

MASKING METER VS MASKING HISTOGRAM



The Masking Meter displays momentary indications of masking—loudness loss—as vertical white lines over the current track’s spectrum and EQ curve (we affectionately refer to this meter as the “Northern Lights”!). These lines indicate that there was some amount of loudness loss at that frequency at that moment: the brighter the line, the greater the masking amount.

The Masking Histogram is the graduated meter above the source EQ. It counts the number of frequency collisions in each critical band. When the loudness loss in a particular frequency band is over a quantitatively determined threshold*, we consider it extreme masking and flag it as a “collision.”

In this way, the Masking Histogram acts as a sort of clip indicator—for each frequency band, it shows whether or not extreme masking has occurred. (Unlike a clip indicator, however, the Masking Histogram counts the number of collisions rather than just showing that at least one instance of clipping has occurred.) The more collisions that have occurred in a band, the higher its histogram bar. By default, the total number of collisions are measured over a moving window of three seconds, but that window can be adjusted in the Options Menu.

We can’t overstate that masking is not necessarily bad. For example, a snare that quickly cuts through a mix can be an audibly desirable masking event rather than a problem, as can masking between two vocalists harmonizing. These tools merely show where masking is occurring—it is up to the engineers (and their ears!) to determine when this masking is problematic and worthy of reaction.

*These thresholds are specific to each frequency band; the way they were determined is discussed in our AES paper. They can be scaled with the Masking Sensitivity slider, discussed below.

Masking Meter features

Masking On/Off

This button allows you to toggle Masking Meter on or off. When on, the drop-down menu becomes accessible.

Masking Drop-down



This drop-down menu shows you all other instances of Neutron present in your mix. (If you're using many Neutrons, you may find this drop-down menu easier to navigate if you name each plug-in instance, which you can do in the top-left corner of any plug-in.) When you select one of these instances, the amount that that instance masks your current track will be shown in the Masking Meter and Masking Histogram.

Let's say hypothetically that you've got Neutron on all tracks in your session. From the Neutron session on your Kick Drum track, if you turn on the Masking Meter and then select another Neutron instance (say, the one on your Bass track) from this drop-down list, you'll automatically be connected to that other instance. The two meters will show how much your Bass track (your



source) is masking your Kick track (your target). (To see how much the Kick track masks your Bass track, you'll need to open up the Neutron instance on your Bass track and then select "Kick" from the drop-down).

Additionally, you'll see two EQ curves: the Kick Drum EQ on at the top, in color, and the Bass EQ on the bottom, in gray-scale, and you'll now be able to make changes to the EQs on both tracks. (Note that if your incoming, selected instance is a component plugin without an EQ—e.g., Transient Shaper, Exciter, or Compressor component plug-ins—you won't see this split view, because there's no additional EQ to control! You'll still see accurate masking calculations based on that instance's signal, however.) Note that when making changes to the target EQ, it's actually sending those changes to the other plug-in. For this reason, adjustments to this second EQ may behave unpredictably with automation. That's why we recommend not writing automation on a remote EQ instance.

Masking Histogram

When using the Masking Meter, you'll notice a momentary indication of frequency collisions displayed as vertical white lines. This simply indicates that there was loudness loss at that frequency at that moment.

The Histogram is the graduated meter above the source EQ. It counts the number of frequency collisions in each critical band. When the loudness loss in a particular frequency band goes over a quantitatively measured threshold*, we consider it extreme masking and flag it as a "collision."

In this way, the Masking Histogram acts as a sort of clip indicator—for each frequency band, it shows whether or not extreme masking has occurred. (Unlike a clip indicator, however, the Masking Histogram counts the number of collisions rather than just showing that at least one instance of clipping has occurred.) The more collisions that have occurred in a band, the higher its bar grows, thus drawing your attention to problem areas. By default, it's measuring collisions over a moving window of three seconds, but that can be tweaked in the Options Menu.

Collisions in a single band of the Masking Histogram can be cleared by clicking on the band once, as in a clip indicator. All events in the Histogram can be cleared by clicking on the "!" indicator to the left.

Masking Sensitivity

The Masking Sensitivity scales the threshold used to determine whether loudness loss is extreme enough to count as a collision (and therefore show up in the Masking Histogram).



At high sensitivity, smaller amounts of loudness loss count as collisions and it will therefore appear that more [extreme] masking is occurring, as the Masking Histogram will fill up more quickly. Conversely, at low sensitivity, fewer collisions will appear on the masking histogram as the loudness loss thresholds will be much higher. The range of loudness loss displayed in the Masking Meter is similarly affected by this Sensitivity control, so that at higher sensitivity a lower amount of loudness loss appears on the meter and at lower sensitivity a larger loudness loss is required to show high amounts of masking (brighter white lines).

It is important to note that adjustments to Masking Sensitivity will not make any adjustments to audio processing. Even though it may seem that masking has decreased when the masking sensitivity is turned down, it is merely that the sensitivity of the meter has been adjusted. As in any meter, it's up to the mix engineer to dial in the meter sensitivity most useful for the source material. If you're seeing a ton of activity, it's likely a combination of good and bad masking, and you probably can't parse that information in a useful manner. In that scenario, the sensitivity may be too high; turning down the sensitivity will help show you only the most extreme amounts of masking between your two tracks. Conversely, if you're seeing no masking but hearing muddiness, it could help to turn the sensitivity up until you see some activity in these meters.

It's much like you'd adjust the integration time of an RMS level meter, or the peak hold time of a Peak meter...you decide just how much information is useful to you.

Inverse Link

Inverse Link makes separation much easier. When on, each node's Gain and Frequency are linked to the same-numbered node in the other EQ. For example, If you add a 3 dB boost in node 4 of the source EQ, you'll cut 3 dB in node 4 of the target EQ below it. Rather than making big, sweeping changes to one track, the goal is to achieve optimal separation with subtle changes to each individual track, such as boosting and cutting each by 1.5 dB rather than boosting or cutting just one by 3 dB. Inverse Link can be toggled on and off to suit any workflow.

Note: Inverse Link controls Gain and Frequency, but not any other aspects of that particular node (e.g. Q, Filter type, Dynamic / Static). This is because though you may wish to share cuts, boosts and frequency positions, it's rare that you'd also want to use identical Q and filter shape values in both tracks. It's more common best practice to cut with narrower Qs and boost with broader, more gentle shapers, to avoid resonance.



Bypass EQs

This is a momentary state that allows you to bypass both the source and the target EQ modules. When doing any equalization, particularly across multiple tracks, it's especially important to always A/B the After/Before to make sure the changes you're making are good changes.

It can also be a useful ear training tool: if you Bypass both EQs and it sounds better, that's OK... it happens to the best of us, and it's through listening, trial and error that we get better. Reset the EQ, and start over! Conversely, if every EQ change you ever make is magical and perfect, please get in touch... that would be a rare talent!

Collision Histogram Peak Hold Time

The Histogram described above is a real-time meter; the peak hold times (in the Options menu) adjust the calculation window between three values of 400 ms, 3,000 ms (default), and infinite.

3,000 ms is the default and most useful setting, and calculates events across a moving window of three seconds.

Infinite can be useful if you want to see all masking that occurs over the entire duration of an audio segment. It won't allow frequency collisions to drop from its memory, displaying them long after they've been problematic, but it will result in a visualization of all areas that cause conflict from start to end. (To clear the histogram, just click the “!” button on the right.)

Gain Offset

Masking calculations are extremely sensitive to the levels of each track. This makes sense when you think of masking in terms of loudness and partial loudness—if you want a track to sound louder, either in isolation or relative to another track, either significantly boosting its gain or significantly cutting the gain of the other track is extremely effective, if potentially naive!

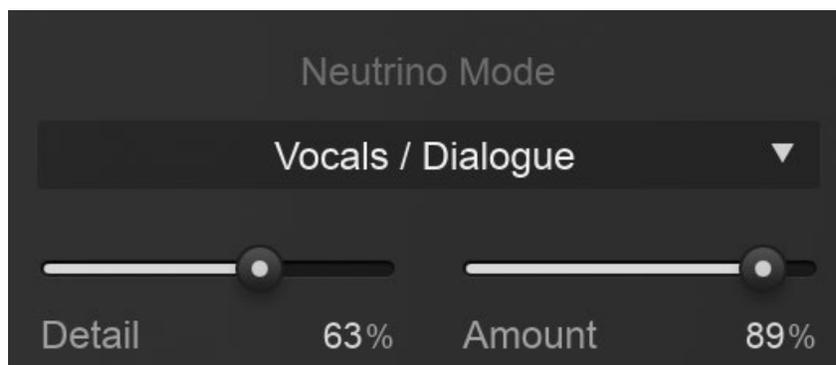
In the case where a DAW applies its plug-ins pre-fader, Neutron has no way to know that this gain has been applied, and therefore that masking has been reduced (or even potentially increased) by changes to the DAW's track volume faders. In such a case, Neutron may show lots of masking but your ears may tell you that none is happening. Since we're transferring incredibly detailed masking information between plug-ins that are hosted pre-fader, it's possible that two audio sources are far enough apart in level for the masking to no longer be problematic and for Neutron not to know, and still report where those sources might be conflicting if they were closer in level.



To get the best, most accurate masking calculations, we highly recommend setting each Neutron instance's Gain Offset amount to the same value as the DAW's track volume fader. It will not in any way affect the audible gain of Neutron, simply the levels at which masking is calculated.



UNDERSTANDING NEUTRINO SPECTRAL SHAPING



The Neutrino spectral shaping algorithm, available in both the free Neutrino plug-in and as a part of Neutron's I/O panel, is designed to improve the overall spectral balance of an entire mix by making subtle changes to each individual track on which it's used. Built for the discerning audio engineer, Neutrino seeks to be one of your secret weapons. Much like you'd extol the virtues of incrementally better A/D converters or other such subtle improvements, Neutrino hopes to aid you in your quest for a better-sounding mix.

Though (as with any effect) it can be pushed too far, the spectral shaping is less concerned with making indulgent, audibly dramatic, or simply louder changes to an individual track (which would ironically unbalance the mix). Indeed, its greatest and most transformative strength is in the smooth sonic sheen that results when it's used on each track within the mix. Similar to the methodology behind analog summing, the subtle benefits are increasingly noticeable the more audio tracks are run through the processing and ultimately summed together. Those with good ears will be able to hear the difference, and judge for themselves when and where it's useful to use across many tracks.





What is Spectral Shaping?

Spectral shaping refers to real-time, dynamic adjustment of the frequency spectrum, falling somewhere between a Dynamic EQ and a multiband compressor. Neutrino has dozens of psychoacoustically spaced frequency bands, each with an adaptive threshold based on the audio signal's RMS. The more a signal exceeds its adaptive threshold, the more frequency-specific attenuation is applied. Neutrino therefore dynamically adjusts the frequencies that contribute most to excess peaks, with modes that allow you to tailor its behavior for a variety of sources.

Spectral shaping can help bring balance to the sound of instruments and voices in a way that traditional compressors and equalizers have not been able to in the past. In the same way that transient shaping applies focused dynamics processing to just the transient portion of a waveform in the time-domain, spectral shaping applies focused dynamics processing to just certain areas within the frequency spectrum. It is a form of subtle, low-ratio compression that is employed individually across dozens of frequency bands as necessary, with unique time constants and automatic adjustment of thresholds based on the incoming audio signal.

When compared to other frequency-dependent dynamics tools like multiband compression, spectral shaping can offer far more resolution across the spectrum. By analyzing the signal across 32 mel-spaced frequency bands, each band is processed uniquely and without applying crossovers. You could imagine spectral shaping as a 32-band dynamic equalizer, with individual band shelf filters for every band, each automatically setting thresholds, time constants, and reduction amounts based on tuned models for each sound source. The result is a more transparent form of dynamic control that is constantly aware of the frequency content present in the incoming signal, and adjusts its processing accordingly.

Neutrino Spectral Shaping features

Neutrino Modes

As engineers, we've grown accustomed to using a single processor on a variety of sources, like an 1176 for compressing vocals, drums, bass, and guitars. However, if you think about how each of these instruments sound, they are really quite unique. With an algorithm like spectral shaping, it's possible to customize the behavior and performance of the processing to each type of audio source. Therefore, Neutrino offers four modes.

- 
- **Vocals/Dialogue Mode** focuses processing on mid and high frequencies for adding clarity and detail that helps vocals sit on top of the mix without becoming harsh or strident.
 - **Guitar/Instrument Mode** smoothes resonant frequencies while preserving the authentic character of the instrument.
 - **Bass Mode** is designed to gently attenuate notes that stick out while adding punch and weight to electric, acoustic, and synth basses.
 - **Drums/Percussive Mode** emphasizes transient detail while minimizing frequency buildups that can make percussive tracks sound “muddy” or “flabby.”

Because the modes are subtly focused on different areas within the frequency spectrum, you’ll likely notice that Neutrino subtly changes the timbral balance of the audio depending on which mode you have selected. You may find that for a particular guitar track, the Bass Mode works well. No problem! Use your ears and enjoy what works best for your music. If you’re happy with the sound then we have no business telling you what to do.

Detail

The Detail knob adjusts the granularity of processing across the frequency spectrum. Because Neutrino is constantly listening and adjusting to the incoming signal, we suggest that you make a small adjustment, pause, then listen to the effect it’s had on your signal.

It’s important to note that despite the analogies, Neutrino is not designed to impart its own particular “sonic character” to your audio in the way analog summing, transformers, or tape might. These analog devices often contribute some unique saturation characteristics. Neutrino is designed specifically to not add any distortion, preserving the original signal as transparently as possible.

Amount

The Amount knob adjusts how much of Neutrino’s dynamic processing is applied.



UNDERSTANDING THE EQUALIZER

What is an Equalizer?

In terms of an audio signal, equalization is the process of adjusting balance between frequencies on the spectrum using linear filters. Equalizer, or EQ, refers to the equipment that facilitates frequency-specific amplitude adjustment. It's important to understand the ins and outs of EQ, how it came to be, and how this influenced the role EQ plays in a modern-day production.

So many of today's audio technologies were not designed specifically for audio recording/production. Indeed, see [iZotope's VocalSynth manual](#) for the history of how the military and communications technologies of yesterday became the pop culture sound of today. A pacifist exception to such historical convention is the EQ which began life as a corrective tool in support of early playback mediums (such as telephone, shellac, or vinyl), at a time when recording was as much about art as it was about overcoming technical limitations and discovering new, exciting ways to reliably commit audio to some form of playback medium.

On early gramophone records for example, the stylus required far wider movements to reproduce low frequency signals, taking up physical space on a record's surface, which limited playing time, and also increased the stylus's susceptibility to higher frequency interference in the forms of clicks and pops.

One solution, developed in the 1920s, was to reduce the amplitude of low frequencies during recording while simultaneously boosting high frequencies, which increased playing time, and applying the inverse 'equalization' curve upon playback, which reduced noise and ensured a more faithful reproduction of the sound as we knew it to sound. These types of EQ were fixed, non-variable changes.



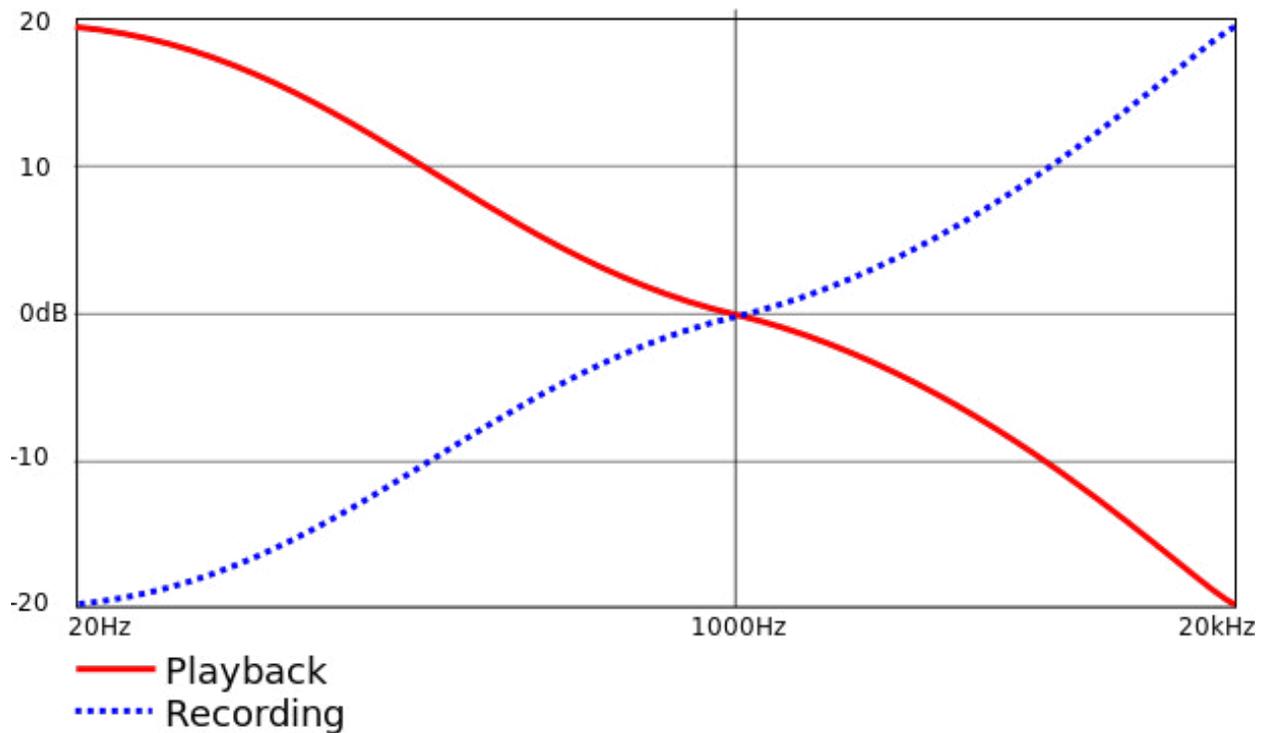


Fig. X: Shown above is the RIAA curve, the most standardized EQ pre/de-emphasis curve of the vinyl playback medium. It was developed in the USA during the 1960s and became a worldwide standard by the 1980s.

John Volkman is usually credited with the first variable standalone EQ design. His EQ, developed in the 1930s, featured a predefined number of user-selectable frequencies with boosts or attenuation. This EQ found a home in the film industry, where it was used often on speech enhancement in post production, and to improve audio reproduction in cinemas. Other early variable EQs include the famed Langevin Model EQ-251A, the Cinema Engineering type 7080 (the first graphic equalizer), and by the 1970s, courtesy of Daniel Flickinger, the first recognizable parametric (allowing free adjustment of center frequency, Gain, and Q) equalizer, which was quickly followed by George Massenberg's EQ in 1972.

Many of these early EQs had quirky sonic characteristics that weren't always celebrated. With digital signal processing allowing new types of equalization technologies, it's interesting to note that for maximum sonic flexibility, many digital equalizers also offer authentic vintage filter emulations alongside any new methods. It's the best of both worlds, which conveniently, and all-too-coincidentally, sets up the segue into the Neutron-specific EQ section of today's history lesson...

EQ Features



Equal parts powerful workhorse and finely tuned racehorse, Neutron's parametric infinite impulse response (IIR) EQ combines the flexibility of processing in the digital domain with the best of both the transparent and the colorful sonic qualities mix engineers often associate with analogue equalizers and signal paths. Sure, we designed it to sound truly great, and believe you'll love it, but let's check out what's behind the superlatives!

Navigating the EQ

The EQ has three sections: the top Global area, where global parameters that affect the entire EQ live; the middle spectrum area, where the EQ metering and node adjustment takes place; and the lower detail pane, for more advanced control over node settings, including Dynamic EQ. This detail pane may be collapsed or expanded by clicking on the small triangle.



Global features

LFE BYPASS

This button only appears when Neutron is loaded in either a 5.1 or 7.1 surround sound configuration. When in surround sound configurations, Neutron processes all channels equally. When enabled, the LFE Bypass will ensure that any audio information in the LFE channel is passed through unprocessed, but with the correct latency compensation.

MASKING METER

This button switches the EQ into the Masking Meter mode, in which it can intelligently analyze the audio metering data from neighboring audio tracks and inform you of any perceptual frequency collisions that may cause masking or inaudibility issues, such as a kick drum and bass guitar competing for the same space in the spectrum, sounding muddy, and/or lacking definition. For more information on Masking Meter, check out the dedicated chapter elsewhere in this manual.

LEARN

Neutron's EQ Learn intelligently analyzes the audio signal, placing any enabled nodes on areas of interest it identifies, such as sibilance, resonance, rumble, and so on. It's an incredibly useful feature, enabling you to quickly locate areas of sonic importance.

Think of it as a starting point, a suggested guide you may wish to tweak artistically, or even something you can switch on in a moment of frustration if you're searching for the right EQ sweet spots. It's only applied to nodes that are enabled, and won't enable or disable any (in contrast to Track Assistant, which may). It also won't affect Gain or Q, and so once nodes are placed, you may hold the Shift key to preserve the frequency placement, and move the Gain up or down to determine if your track sounds better with that specific area of interest boosted or cut.

RESET

This will reset the entire EQ to default values if you wish to start over. If you click this button and experience instant remorse, never fear...you can open the Undo History and revert the change to go back to the settings you had prior to reset.

Per band features

The node circles on the EQ display mark each of the eight EQ bands. You can adjust an EQ band by clicking on a node and dragging the crosshairs:

- Horizontally to change the frequency of the band.
- Vertically to change the gain of the band.

Move the mouse over the handles on each side of the band to adjust the bandwidth (Q) of the EQ band, by dragging with the mouse and widening the band. You may also use your mouse or track-pad's scroll action to widen/narrow a selected band. As you adjust the nodes you will see multiple EQ curves. The white curve is the composite of all EQ bands while the selected band shows as a thin line in the band's specific color.

FILTER TYPES

Neutron's EQ offers 12 adjustable bands with a variety of filter types.

Bands	High-pass band	Low-shelf band	Bands 1-8	High-shelf band	Low-pass band
Filters	Flat Resonant	Analog Baxandall bass Vintage	Proportional Q Band Shelf	Analog Baxandall treble Vintage	Flat Resonant

FLAT HPF/LPF

These so-called Butterworth filters are optimized for maximum flatness without ripple or resonance in the passband or stopband. They pass frequencies above (high-pass) or below (low-pass) the center frequency while attenuating any frequencies above/below that point. These filters are very utilitarian and can be used to cut rumble or hiss, which may increase headroom. A variety of slope steepness options are available.

RESONANT HPF/LPF

This filter is equipped with a resonance control, which can modify the curve to either emphasize the cutoff frequency with positive resonance (e.g. add "oomph" to a kick drum fundamental while also cutting rumble, or smoothly enhancing the bottom end of a vocal centered around its fundamental) or smooth the curve around the cutoff frequency, with negative resonance.



ANALOG HIGH/LOW SHELF

The Analog, Baxandall, and Vintage shelves can be used to reduce or increase signals above or below a set frequency. The Analog shelves in Neutron are the most CPU-efficient, work-horse shelves for simple frequency lifts or cuts.

BAXANDALL TREBLE/BASS SHELF

Based on a two-knob treble and bass vintage equalizer designed by Peter Baxandall in the early 1950s, these filters offer gentle, sonically pleasing slopes. Regrettably, Peter never received much in the way of royalties for his design, which is among the most ubiquitous. (It's behind those treble and bass adjustments in millions of hi-fi and car stereo systems.)

The Baxandall filter's complex math minimizes the phase delay often found in many analog/shelving EQs. Phase displacement isn't always bad. Neutron's Vintage filter uses phase coloration, but minimizing such artifacts is what allows a Baxandall filter to make significant changes to a frequency spectrum without drastically changing the overall sonic character. These subtleties are phenomenal at enhancing air in a vocal or guitars, or giving greater emphasis to synths, basses, and drums without adding a harsh edge.

Unlike the original Baxandall EQ design which had no variable center frequency control, Neutron allows fully adjustable frequency response. Note that, in Dynamic Mode, this is the most CPU-intensive filter offered by Neutron.

VINTAGE HIGH/LOW SHELF

These filters exhibit a complimentary frequency dip when boosting (vice versa when cutting) modeled after the renowned Pultec equalizer. Creating a complex slope with one node is one of the secrets behind why subjectively, the Pultec design sounds so good. As you boost in the low end (say, between 40-100 Hz), you'll notice the complimentary dip in the curve is between 700 Hz to 1.5 kHz, which tends to be where nasty, nasal-sounding resonances occur, thus killing two birds with one stone. (Note: We love animals, so please don't go killing any actual birds on our account.)

BAND SHELF

Though this is a bell filter, this filter's shape has a flat top, allowing the user to perform wider, flatter EQ adjustments in a particular frequency area. This is useful for attenuating a block of boxy frequencies, like unpleasant buildup in the 500-900 Hz range or boosting vocal/dialogue presence in the 3-7 kHz range.



PROPORTIONAL Q

This innovative filter's shape varies in proportion to the amount of cut or boost, which is as highly useful as it is aesthetically beneficial. It's more transparent when making more extreme gain adjustments. As the cut or boost is increased further away from center, the shape tightens for more precision, which is particularly useful for suppressing resonances, hums, or other narrow frequency bands that need to be removed. This behavior is distinct from the Q, which you're still able to freely adjust.

FREQUENCY / GAIN / Q

You may adjust the frequency, gain, and bandwidth for the currently selected band in two ways: graphically, over the Spectrum View, or by clicking and dragging on the sliders in the EQ detail panel. Note that, by design, not all filter types have adjustable Gain or Q, so you may see either hidden or disabled depending on your choice of filters.

DYNAMIC MODE

The Analog, Baxandall, Band shelf, and Proportional Q filters can be toggled between a static and dynamic behavior. In static mode an EQ adjustment will be consistently applied to the audio, whereas in Dynamic mode, the behavior of the EQ curve visually and audibly reacts to an input signal. A node's visual shape is circular when that band is in static mode, and the Dynamic-mode-related buttons and meters become disabled.

Working like a combination of static EQ and adaptive compression, this is one of the features that makes Neutron's EQ so versatile. Dynamic mode allows you to set a compression threshold, which adjusts when the volume of the signal in the frequency range of the input signal passes over that threshold.

This allows an EQ adjustment to behave differently depending on the input sound, such as a large explosion, a sudden gunshot, a dialogue "ess" reduction and any other scenario. A user-definable threshold sets the point at which the dynamic ballistics begin to kick in. Taking an audio input from only the area surrounding the EQ node, the further it falls above or below the threshold, the greater the adjustment will be.

The attack and release times for the trajectory of this dynamic behavior are affected by the node's frequency, and will react differently on a sibilant dialogue area, to say, a low-frequency LFE burst for example.

This intelligent behavior results in reactive, program-dependent, and most importantly, more transparent mix results, which allows you to perform much more transparent EQ adjustments



that affect your audio only when you'd actually like them to.

COMPRESS

In this mode, when a specified frequency range exceeds the threshold, boosts are reduced and cuts are increased, thus compressing the dynamic range of the affected frequencies. For instance, if you had an occasional harsh, peaking frequency area, a dynamic EQ cut would only reduce that frequency area when the harsh peaking was actually present, and with the right degree of variable strength, preserving the overall sonic color of your mix.

EXPAND

In this mode, filters respond more like an expander. A boost you've programmed in will only start to boost once the specified frequency range exceeds the threshold, and a cut will decrease in strength. This can expand the dynamic range of the affected frequencies. For example, if you wanted to bring out a particular sound in a mix (kick drum, sound effect), you could adjust a filter to boost at the appropriate frequency and set the dynamic settings to respond to the level of the sound. This boosting filter will only activate when the sound is present, thus expanding the dynamic range and enhancing the impact of these frequencies.

THRESHOLD

Threshold sets the point at which the dynamics processing begins to take place.

SIDECCHAIN SOURCE

Neutron's Dynamic EQ has powerful and detailed sidechain support, meaning you can have a node's dynamic behavior dictated by a wide variety of other input signals. This is highly useful if you'd like a dialogue stem to automatically duck certain frequencies in the music stem for instance, or perhaps a kick drum momentarily duck certain frequencies in the bass guitar. It preserves overall volume while allowing elements of the mix to interact and work together. It works with both internal and external audio.

By default, a Dynamic node is triggered by its own audio input (so node 5 would default to a sidechain of Internal Band 5), but you can use the Internal band choices (Int. HP = high pass, Int. LS = low shelf, etc.) to choose any other band of the EQ. You might like the warm midrange of a guitar, say node 3, to actually trigger the harsh high end, say node 7, dynamically up or down. It's a phenomenally powerful way to balance a signal within itself. You can also select Internal Full, which will take the full bandwidth of the audio signal, and not anything node specific. (Super-user note: Even if a node is disabled, it can be used as a sidechain to any other node—set its frequency and Q as you would for any enabled band.)



If you're using the DAW's external bus routing functionality, you can take audio from another track or bus, and use that as the sidechain/key input into Neutron. To use the full external audio signal as a sidechain for your dynamic EQ node, choose External Full in the sidechain dropdown. Alternatively, the external audio source can be filtered through any of the bands in your EQ by choosing any of the External bands (Ext. HP, Ext. LS, Ext. Band 1, etc).

Utility functions

MIX

The Mix slider in the signal flow is a highly useful feature, allowing you to do parallel EQ. At 100%, you're hearing only the audio processed by EQ, whereas at 50% you're hearing an even blend between unprocessed and EQ'd audio. Often times, blending in more extreme EQ settings (particularly shelves) has a much more pleasant, sweeter sound, than simply dialing in a gentler EQ curve. Parallel EQ is often one of the hidden tricks that simple sweetening plug-ins tend to pull, but here it's exposed for you to control directly.

ALT+SOLO

If you hold down the Alt key and click on the spectrum, you have a temporary "audio magnifying glass" that lets you hear only the frequencies that are under the mouse cursor, without affecting your actual EQ settings. This is useful for pinpointing the location of a particular frequency in the mix without changing your actual EQ bands. Releasing the mouse button returns the sound to the actual EQ. The Q of this filter can be adjusted in the Options window.

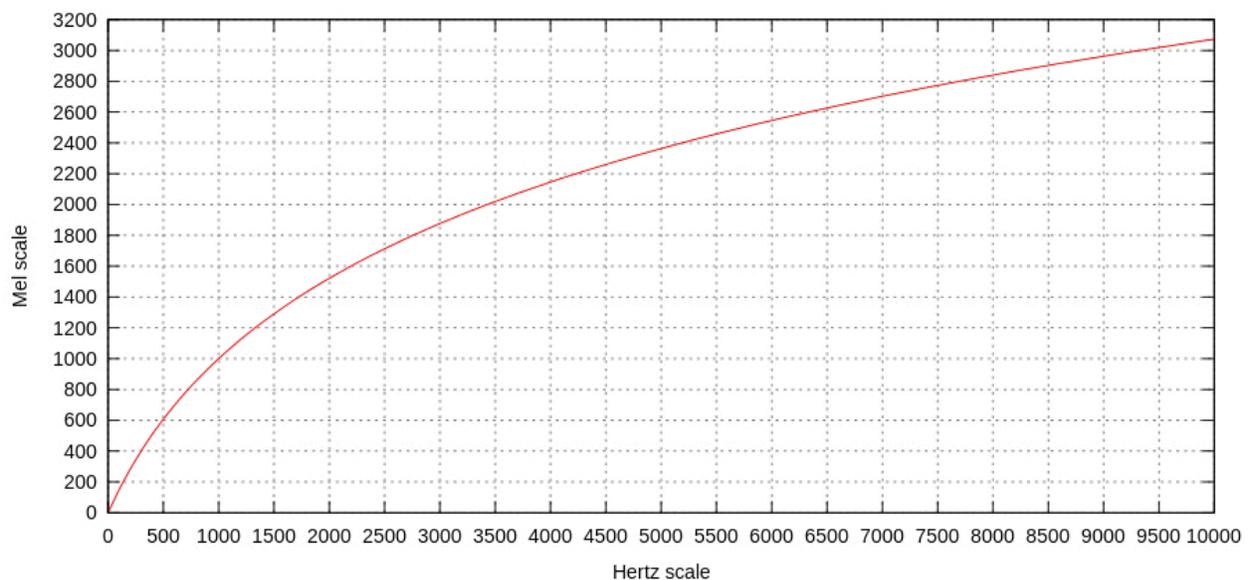
NODE SOLO

To solo a specific EQ band, hold Alt and then click on the node you wish to solo. This engages a band pass filter for the audio affected only by that particular node's filter.

ADJUSTABLE SCALES

Depending on what it is you're EQ'ing, different frequency scales are useful. Neutron's EQ allows a number of EQ scales:

- **Linear** by nature offers an even view across all frequencies. This does overemphasize the higher frequencies where there may not be as much useful information, but can be useful for dialing in 'air' bands or EQ brightness.
- **Mel** uses a scale that reflects a perceptual scale of pitches that humans judge to be an equal distance apart. Here's a useful graph (Wikipedia, Krishna Vedala, licensed under Creative Commons) that shows how a Mel scale relates to a Hz scale:



- **Logarithmic, Flat Logarithmic, and Extended Logarithmic** are non-linear scales that offer much more detail on the low end and midrange, useful for the vast majority of EQ tasks, which is why Neutron defaults to Extended Log
- **Piano Roll**



UNDERSTANDING THE COMPRESSOR

What is a Compressor?

Simply put, a compressor adjusts dynamic range. Most commonly, it reduces it using downward compression, but as you'll discover, Neutron is capable of both upwards and downwards compression.

Limiters/Compressors were originally invented to prevent overmodulation in a radio broadcast signal. As decades past, and engineers realized more of the practical and aesthetic use cases, compressors have become one of the most used audio processing techniques in modern recording, mixing, and mastering. They can help improve intelligibility in vocals, tame an overly aggressive snare drum, and restrict dynamic range across a mix so that the listener does not have to keep adjusting the volume on their playback system.

Compression is one of the effects we hear most but, if done correctly, the listener will not even be aware that it's there. While many mix engineers favor compressors that color their audio, when it comes to mixing, transparency is key. One of the challenges mixing engineers face is that different parts of the frequency spectrum will require different compression settings to effectively reduce dynamic range. Individually tuning the attack time, or the length of time before the compressor begins reducing gain, is key.

If a recording of a bright guitar and a bass drum is sent through a compressor with a short attack time, the transients of the guitar will be tamed, but the bass drum will lose its punch and feel choked. With the short attack time, the low frequency transient information in the bass drum does not have enough time to make it through before the compressor kicks in. If the attack time is set longer, the bass drum may have the desired punch before the compressor kicks in but the guitar will sound harsh. Its high frequency transients take a far shorter time to get through—and as a result, the compressor will not compress the guitar much at all.

Regardless of whether a shorter or longer attack time is used, a single-band compressor will favor different sections of the frequency spectrum in the recording and change the relationship between elements in the mix. In order to effectively compress the wide range of frequencies



contained in a recording, different attack and release times would be required for different parts of the frequency spectrum. Multiband compression makes this possible, and Neutron is capable of single, dual, or three-band compression.

Compressor Features



Navigating the Compressor

The Compressor has four sections:

1. The top Global area, containing the global parameters that affect the entire Compressor.
2. The Gain Reduction meter section just below that.
3. The multiband spectrum view, where you may set crossover points and adjust the sidechain detection circuit filter
4. The lower detail pane, housing the detailed per-band compression controls.



Global features

LFE BYPASS

This button only appears when Neutron is loaded in either a 5.1 or 7.1 surround-sound configuration. When in surround-sound configurations, Neutron processes all channels equally. When enabled, the LFE Bypass will ensure that any audio information in the LFE channel is passed through unprocessed, but with the correct latency compensation.

VINTAGE MODE

Neutron's Compressor is capable of two very different styles of compression, Digital and a hitherto un-released Vintage mode. Where Digital is a more transparent, surgical compressor, Vintage is more colorful, emulating a number of sonic behaviors from a variety of beloved older analog compressors. In Vintage mode, the Attack reacts much more quickly (indeed, an 1176 is capable of very low Attack times) but then begins to ease in, which sounds punchier, but less transparent than the Digital mode. Knee is inaccessible in Vintage mode, as it scales with Threshold. The Release is also gentler, which is why some might describe this algorithm as sounding more pumpy, when such an adjective is desirable for your mix. Analog isn't better than digital isn't better than analog. It's all about options, folks!

OUTPUT GAIN

If you're using the Compressor in a downward direction, to reduce dynamic range, there are two ways you may wish to add a transparent Gain boost to the overall output of the module to compensate. The opposite is true of using it in upwards mode, where you may subsequently need output gain attenuation. This slider allows you to dial in a manual amount of Gain adjustment to the output of the Compressor module, to ensure optimum gain staging as it passes into the next module. This is especially useful if you have Compressor 1 and Compressor 2 in series. The other method is to use the Auto Gain control, which is described just below.

LEVEL DETECTION MODE

These three buttons, RMS, Peak, and True, allow you to adjust which level detection mode the Compressor uses, as follows:

1. **Peak** enables Neutron's detection circuit to look at peak levels of the incoming signal. In general, this setting is useful when you are trying to even out sudden transients in your music.

- 
2. **RMS** enables Neutron to look at the average level of the incoming signal. RMS detection is useful when you are trying to increase the overall volume level without changing the character of the sound.
 3. **True** mode behaves much like RMS mode, but with some key advantages. Unlike RMS, True mode produces even levels across all frequencies. Additionally, True mode will not produce the aliasing or artifacts that RMS detection can cause (a signal-dependent behavior that is true of any RMS-based compressor, not just Neutron). At times these may sound good to your ears, but at other times they may sound like a word we're not allowed to print.

AUTO GAIN

When selected, Auto Gain compensation calculates levels of both the input and output signals of the compressor for each crossover band and applies the appropriate gain to the output signal to compensate for the difference. This automatically brings audio volume to a level comparable to the unprocessed audio, and acts as a smart “make-up gain” control that adapts to the mix over time.

This is a useful way of helping to ensure that your audio isn't better because it's louder.

AUTO RELEASE

This automatically adjusts the Release time of the Compressor based on analysis of the input signal. If a transient signal is detected, the Release time is scaled to be shorter for less pumping. If a sustained note is detected, the Release time is scaled to be longer for lower distortion.

The Release time is not arbitrarily made up. It's scaled in relation to the Release value set by the user. For example, if you are using the Compressor with the Release time set to 100 ms, the Release time will be automatically adjusted to a value within a range of 20 ms to 200 ms, depending on the type of signal that is being processed.

Auto Release is one of those secret weapons allowing producers good, transparent, and responsive compression. You may well find that once you're comfortable with the result, it stays on the majority of the time. Indeed, in Vintage mode, Auto Release is always on, as it helps support the vintage-modeled release behaviors.



LEARN

In multiband mode, this searches for natural crossover cutoff points using a few criteria, including minima in the spectrum. Once Neutron has found a stable and transparent place for the cutoffs, the Learn function will disable automatically.

RESET

This will reset the entire Compressor to default values if you wish to start over. If you click this button and experience instant remorse, never fear...you can open the Undo History and revert the change to go back to the settings you had prior to reset. De-compression, if you will.

GAIN REDUCTION TRACE

This view offers a scrolling meter that displays the incoming signal's waveform with a superimposed curve that illustrates the amount of gain reduction taking place in real time. It uses a rectified waveform to better illustrate the compression behavior.

When using multiband processing, the current selected band's gain reduction and waveform are drawn in this meter. The Gain Reduction Trace can help you to set attack and release controls appropriately and monitor the envelope of gain reduction.

When seeking to achieve maximum transparency, it's important to pay close attention to the trace juxtaposed over the waveform, and how it illustrates the effect a changing Release time can have on allowing audio to return to 0 dB of gain reduction before the next transient.

Note: the scale can be adjusted on the left-hand side.

VU METERS

In Vintage mode, the gain reduction meters use a VU meter, one per band. There is something magical about the audio/visual connection between the gain reduction that's occurring and the way the ballistics of the VU meter give you a sense of what's going on.

SIDECCHAIN FILTER

This filter, enabled via the Sidechain filter icon on the bottom-left of the multiband spectrum view, allows you to specify the frequency response of the detection circuit used by the Compressor, so that it is more or less sensitive to certain frequencies. It includes low- and high-resonant pass filters.



This is particularly useful when using the Compressor in single-band mode, as you could roll off all of the lows, but at a mid-range or a high resonance, to have the Compressor respond much more to sibilance or harshness, or a snare drum's crack rather than thwack (technical term).

When enabled, you'll see an icon for each low and high filter overlaid on the multiband spectrum. Click to grab and drag an icon horizontally to adjust frequency, and vertically to adjust resonance.

SIDECHAIN FILTER SOLO

This allows you to audition the filtered sidechain signal only, so that you may hear the same audio input that's triggering the compressor. Click the icon to the right of Sidechain filter (just below the multiband spectrum view) to engage it. It definitely helps dial in the sidechain filter EQ described above.

For some, 'Sidechain filter solo' is also known to be a tongue twister in Parseltongue.

Per band features

THRESHOLD

Threshold sets the point at which the dynamics processing begins to take place. With positive ratios, this means signals overshooting the threshold, and with negative ratios, this means signals falling below the threshold.

RATIO

Ratio allows you to adjust the amount of level adjustment the compressor will apply from any given input signal. A ratio of 3:1 means the for every 3 dB a signal overshoots the Threshold, only 1 dB of gain increase will occur.

Neutron's Compressor is capable of both upwards compression (with a negative ratio) and downwards compression (with a positive ratio). Additionally, the Compressor supports positive ratios high enough to be considered a Limiter, which when combined with the multiband-capable processing, is particularly useful for processing electronic sounds, or working in genres typified by high RMS values. For acoustic material, we recommend lower ratios and more gentle compression. Only you can prevent over-compression.



KNEE

This variable knee allows you to adjust this control to set the desired character of the compression. Since “character” is arguably one of audio’s most overused words, here’s what we mean here: Higher settings result in a “soft knee” setting with a subtler, natural-sounding compression, whereas lower settings result in a “hard knee” setting with a more aggressive-sounding compression, often used as an intended effect on individual tracks such as kick and snare drum(s).

ATTACK / RELEASE

Adjust the attack and release controls to set how quickly the Compressor module reacts to audio that crosses the threshold.

- **Attack** determines how quickly the dynamic processor reacts when the threshold is reached.
- **Release** determines the amount of time before the dynamics processor returns the level to normal once the signal is no longer above the threshold.

MIX

Adjust this slider to control the dry/wet mix of the direct, unprocessed signal to the processed signal for the module.

GAIN

This behavior is identical to the Output Gain parameter described above, but is specific to whichever band you have selected.

SIDECCHAIN

Neutron’s Compressor has powerful and detailed sidechain support, meaning you can have a band’s dynamic behavior dictated by a wide variety of other input signals.

By default, a band is triggered by its own audio input but you can use the Internal function to choose any other band of the Compressor. You might like the warm midrange of a guitar (say, band 2) to actually trigger the boomy, muddy low end (say, band 1) dynamically up or down. It’s a phenomenally powerful way to balance a signal within itself. You can also select Internal Full, which will take the full bandwidth of the audio signal, and not anything node specific.



If you're using the DAW's external bus routing functionality, you can take audio from another track or bus, and use that as the sidechain/key input into Neutron. Not only can you take the External Full bandwidth audio signal, but you could also choose any External Bands, which passes the External audio through the same internal bands to allow you to choose only certain areas of your External signal as sidechain/key inputs.

ADD/REMOVE

The number icons at the top of each band (1, 2, and 3) can add or remove that band from the equation.

BYPASS

The B icon allows you to preserve that band's position, but bypass the processing so that the band only passes dry audio.

SOLO

The S icon allows you to solo the current output of just that band, whether the processing is bypassed or unbypassed.

Utility functions

MIX

The Mix slider in the signal flow is a highly useful feature, allowing you to do parallel compression. At 100%, you're hearing only the audio processed by Compressor, whereas at 50% you're hearing an even blend between unprocessed and processed audio. Often times, blending in more extreme compression settings (as in...majorly crushed) with completely unprocessed signal (typically around 50 - 80% dry, 50 - 30% wet) gives you a much smoother, more polished sound without eliminating the musicality that peaks and dynamic range have to offer. Note that this a global setting, where unprocessed means audio input to the Compressor, and processed means audio output from the Compressor. Audio output from the Compressor may contain some dry audio, due to the per-band Mix control.

UNDERSTANDING THE EXCITER



What is an Exciter?

An exciter adds harmonic distortion to an audio signal. It accentuates and enhances audio already present, and can provide a simple perceptual boost in presence, or a completely overdriven sound saturated with loud additional harmonics.

When discussing the supposedly magical qualities of any audio tool that adds harmonic distortion, philosophy and experience often give way to conjecture. Harmonic distortion is, to be fair, one of the most enjoyable tools in the arsenal. It's important to understand and respect that although harmonic distortion was once bemoaned as an artifact of the tape/tube recording mediums of the time, it is now celebrated as a sonic benefit—when used judiciously.



Perhaps one of the more compelling examples is that of tape saturation. Technically speaking, a reel of magnetized tape can hold only so much magnetism. Attempting to add excess magnetism, by driving a signal too loudly into the tape, will cause the oxide particles to saturate, creating typically odd harmonics not previously present. Now of course, such an artifact does not sound good 100% of the time, yet we'll remember and/or appreciate that there was a time where you really didn't have a choice, and had to carefully monitor input levels while you recorded to the only medium available: magnetic tape. Nowadays, we're blessed with the choice of when to and when not to use tape saturation.

Though early digital adopters celebrated the sonic transparency, flexibility, and the unfettered possibilities offered by digital algorithms, this frontier spirit soon missed the sound of 'home.' Thus we have for years explored ways to model, replicate, and enhance the wonderful and creative non-linearities of harmonic distortion. Ultimately, products like Neutron offer the best of both worlds: analog-style and digital distortions, from Tape to Tube to Warm and Retro sounds, that take advantage of the digital domain to try some new things not possible in the Analog domain.

Exciter Features

Global features

LFE BYPASS

This button only appears when Neutron is loaded in either a 5.1 or 7.1 surround-sound configuration. When in surround-sound configurations, Neutron processes all channels equally. When enabled, the LFE Bypass will ensure that any audio information in the LFE channel is passed through unprocessed, but with the correct latency compensation.

PRE-EMPHASIS MODES

These modes allow you to weight the saturation in or away from different areas of the frequency spectrum.

- Full offers a gentle, low-mid frequency bump.
- Defined offers a gentle, high-mid frequency bump.
- Clear offers a gentle, low-mid frequency attenuation.



POST FILTER

The high shelf icon overlaid on the multiband spectrum view is a gentle shelving filter capable only of attenuation, to a maximum of -12 dB within a range of 1 kHz to 20 kHz. Drag the filter node to adjust the frequency and gain of the filter, which will be applied to the entire Wet signal, allowing you to further adjust any high frequencies that have been generated by the Exciter module.

LEARN

In multiband mode, this searches for natural crossover cutoff points using a few criteria, including minima in the spectrum. Once Neutron has found a stable and transparent place for the cutoffs, the Learn function will disable automatically.

RESET

This will reset the entire Exciter to default values if you wish to start over. If you click this button only to realize how literally unexciting it is, never fear...you can open the Undo History and revert the change to go back to the settings you had prior to reset.

Per band features

DRIVE

This controls the amount of excitation. Increasing Drive will subtly decrease peak levels for some program material (as would driving a guitar amp hard), but shouldn't reduce perceptual loudness. It's that "rounding off" effect you often hear when overdriving a signal.

X/Y

This allows you to blend between different harmonic profiles, creating unique and as-yet-unheard algorithms. Carefully curated, dynamic constants accurately preserve the non-linearities of the various algorithms while ensuring a seamless transition as you mix between different behaviors in four directions.

Many audio engineers move seamlessly between their various senses, talking in synesthetic terms when describing audio. Subjective mix terms like warm, bright, soft, harsh, red, and blue mean something different to everyone. This X/Y pad helps you dial in exactly what any such term means for you. The four algorithms to mix between are:

- Tube, which is characterized by a clear tonal excitation that emphasizes dynamics and transient attacks and tends to sound less harsh than Tape or Retro.
- Warm is similar, but sounds gentle' than Tube, as it only generates quickly decaying even harmonics. You may find this gives an intangible life to a sterile-sounding track, particularly a vocal track.
- Tape is a brighter-sounding array of odd harmonics typical of the saturation imparted by magnetic tape machine, but without the crosstalk, hiss, wow, and flutter that might ruin your mix.
- Retro is an edgier, more biting algorithm inspired by transistor characteristics, including a slowly decaying row of odd harmonics. If you like the transistor-based fuzz behind the signature sound of The Black Keys, and a great many records by The Beatles, you'll dig this option.

BLEND

This adjusts the balance between the dry/unprocessed and the wet/processed signal. Oftentimes, pleasing results can be obtained by pushing Drive, but reducing Blend to ensure some clean, clear signal still remains.

ADD/REMOVE

The number icons at the top of each band (1, 2, and 3) actually add or remove that band from the equation.

BYPASS

The B icon allows you to preserve that band's position, but bypass the processing so that the band only passes dry audio.

SOLO

The S icon allows you to solo the current output of just that band, whether the processing is bypassed or unbypassed.

Utility functions

MIX

The Mix slider in the signal flow is a highly useful feature, allowing you to do parallel compression. At 100%, you're hearing only the audio processed by Exciter whereas at 50% you're hearing an even blend between unprocessed and processed audio. Note that this a global setting, where unprocessed means audio input to the Exciter, and processed means audio output from the Exciter. Audio output from the Exciter may contain some dry audio, due to the per band Blend control.



UNDERSTANDING NEUTRON'S TRANSIENT SHAPER

What is a Transient Shaper?

A Transient Shaper uses a dynamics processor that allows you to alter characteristics of a sound's Attack (the initial hit of the sound in your ear) or Sustain (used here to refer to everything not Attack). It is especially useful for shaping percussive sounds.

For example, it can be used to emphasize the stick attack of a snare drum sound, while de-emphasizing its body or room sound. Careful use of the Transient Shaper module can help a wide range of material sit differently in a mix, making it a powerful sound-shaping tool for any style of music.



Transient Shaper Features



Navigating the Transient Shaper

The Transient Shaper has four sections:

1. The top Global area, containing parameters that affect the entire Transient Shaper.
2. The Gain Adjustment meter section just below that, to meter gain adjustment as it happens.
3. The multiband spectrum view, where you may set crossover points.
4. The lower detail pane, containing the detailed per band controls.



Global features

LFE BYPASS

This button only appears when Neutron is loaded in either a 5.1 or 7.1 surround-sound configuration. When in surround-sound configurations, Neutron processes all channels equally. When enabled, the LFE Bypass will ensure that any audio information in the LFE channel is passed through unprocessed, but with the correct latency compensation.

GLOBAL ENVELOPE MODES

These global modes allow you to choose between three different Transient Shaping algorithms.

- **Precise:** Fastest recovery time to the next transient. Most accurate and responsive when adding or removing attack to a signal.
- **Balanced:** Middle ground of the three modes. Fairly quick attack and medium release time when recovering from one transient to the next.
- **Loose:** Slowest transient recovery time for all types of material. Best mode for adding large amounts of sustain.

LEARN

In multiband mode, this searches for natural crossover cutoff points using a few criteria, including minima in the spectrum. Once Neutron has found a stable and transparent place for the cutoffs, the Learn function will disable automatically.

RESET

This will reset the entire Transient Shaper to default values if you wish to start over. If you click this button and experience instant remorse, never fear...you can open the Undo History and revert the change to go back to the settings you had prior to reset.

GAIN ADJUSTMENT TRACE

This view offers a scrolling meter that displays the incoming signal's waveform with a superimposed curve that illustrates the amount of gain adjustment taking place in real time.

When using multiband processing, the current selected band's gain reduction and waveform are drawn in this meter. The Gain Adjustment Trace can help you to set attack and release controls appropriately and monitor the envelope of gain reduction.



Paying close attention to the trace juxtaposed over the waveform, and how it illustrates the effect changing envelope modes can have on allowing audio to return to 0 dB of gain before the next transient, is an important tool when seeking to achieve maximum transparency.

Note: the scale can be adjusted on the left-hand side.

Per band features

ATTACK

Positive values will emphasize the attack of transients while negative values will decrease the attack. This parameter is a useful way of having an element cut through or sit back in the mix without adjusting overall volume or EQ...try it!

SUSTAIN

Positive values will increase the sustain portions of the track, while negative values will decrease the sustain. Increasing Sustain can inflate a weak kick drum for the better.

CONTOUR

The Contour control allows the user to tweak the per-band response of the Transient Shaper, a powerful new feature for addressing the response across a multiband spectrum, where you may wish to have different behaviors on the low end (read: kick drum) vs. a vocal.

- **Sharp** has the fastest and tightest release time and works best on short and staccato material such as drums.
- **Medium** offers a transparent and linear release envelope. This mode tends to work well on a majority of material.
- **Smooth** is the slowest envelope of all the modes. Smooth works best on sustained instruments and signals and allows more of the initial transient through, affecting Sustain in a gentle, unobtrusive way.

ADD/REMOVE

The number of icons at the top of each band (1, 2, and 3) can add or remove that band from the equation.



BYPASS

The B icon allows you to preserve that band's position, but bypass the processing so that the band only passes dry audio.

SOLO

The S icon allows you to solo the current output of just that band, whether the processing is bypassed or unbypassed.

Utility functions

MIX

The Mix slider in the signal flow is a highly useful feature, allowing you to do parallel Transient Shaping. At 100%, you're hearing only the audio processed by Transient Shaper, whereas at 50% you're hearing an even blend between unprocessed and processed audio.



UNDERSTANDING THE LIMITER

The surround-sound, BS.1770-2/3-compliant True Peak Limiter in Neutron provides intelligent digital loudness maximization of the signal, while ensuring there are no True Peak overflows, across all of your mono, stereo, and surround channels.

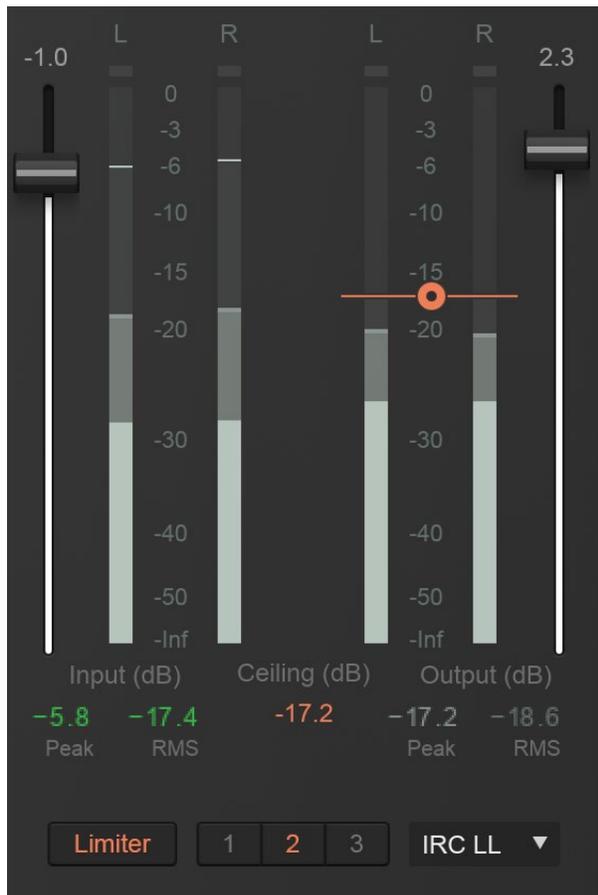
The intelligent digital loudness processor is designed for neutral or transparent limiting. It does so by analyzing the incoming source material and leveraging a psychoacoustically pleasing algorithm, reacting quickly to transients and reacting more slowly to steady, lower frequency tones. In doing so, it is optimized to preserve transients which makes them sharper and more clearly present in the output signal, even when aggressive limiting is taking place. This award-winning technology is what's behind iZotope's legendary IRC limiting algorithms.

Navigating the Limiter

Neutron's Limiter lives in the I/O section of the channel strip, overlaid on the output meters, which are capable of both Peak+RMS and Peak+Short-term loudness metering. When the Limiter is actively limiting audio, you will see the amount of gain reduction shown in orange from the top of the meter.



Limiter features



LIMITER ON/OFF

The button aptly labeled **Limiter** enables you to turn the Limiter on or off. If you're not making extensive use of the Limiter, we recommend you have it disabled so as not to unintentionally limit your audio.

OUTPUT GAIN

The Output Gain slider is penultimate to the Limiter in the signal flow, so it acts as Limiter input gain when the Limiter is enabled. It allows you to increase the loudness of your audio without affecting the True Peak level. It provides up to 10 dB of additional input gain into the Limiter.



CEILING

This determines the maximum output level of your audio - all peaks above this point will be limited. You can set the Ceiling of the Limiter via the Ceiling slider overlaid on the output meter, within a range of 0 to -20 dB.

LIMITER ALGORITHM

There are three limiting algorithms in Neutron, each with a different sonic quality and latency requirement. Low latency is important to avoid lag or loss of sync when mixing to picture, dealing with limited latency compensation, or a control surface that needs to remain responsive. You may choose to optimize the limiter in different ways using the following algorithms:

- **IRC II** - Transparency. This algorithm uses higher latency (3772 samples at 48 kHz) to ensure maximum transparency when hitting the limiter hard, particularly with low frequencies that you'd like to remain loud, without crunch or distortion.
- **IRC LL** - Low Latency. This algorithm significantly lowers latency (as low as 120 samples at 48 kHz) to ensure efficient performance, yet still maintains a high level of sound quality and broadcast-standard True Peak performance. You may not notice a difference in sound quality unless you're driving the limiter quite hard. The difference is most noticeable on low frequencies, and you may choose to use this algorithm to add a certain unique sonic character to certain low frequencies.
- **Hard** - Brickwall and Zero Latency. The hard limiter uses the Ceiling as an absolute guide, and the final output level will not exceed this point. It's the most CPU- and latency-efficient algorithm in Neutron, but it is not True Peak compliant, as it is extremely difficult to achieve adequate True Peak compliance with zero latency.

LIMITER MODE

Three user-definable character options allow for more direct control over the adaptive, transparent nature of the limiting algorithm:

- **Mode 1:** Clear. The Limiter will respond more quickly in order to better present fast-moving transient material in the mix.
- **Mode 2:** Smooth. Smooth is the most common, best-sounding middle ground between Clear and Thick. It's the most appropriate algorithm for the majority of program material, including most vocals and dialogue.
- **Mode 3:** Thick. The Limiter will respond to audio more slowly, useful for louder, slower-moving sounds like a big explosion sound effect, or a bass/low-frequency swell, where you wouldn't want an aggressive limiter to break the sound up.



LFE BYPASS

This button only appears when Neutron is loaded in either a 5.1 or 7.1 surround-sound configuration. When in surround-sound configurations, the Limiter is linked across all channels, meaning that gain reduction is applied equally to preserve the positioning of the surround image and avoid steering. When enabled, the LFE Bypass will ensure that any audio information in the LFE channel is passed through unprocessed, but with the correct latency compensation.



GENERAL FUNCTIONS

Surround Sound

Surround-sound formats

Neutron supports the following surround-sound formats in the following hosts. Neutron processes all channels equally, unless LFE processing is bypassed in any particular module.

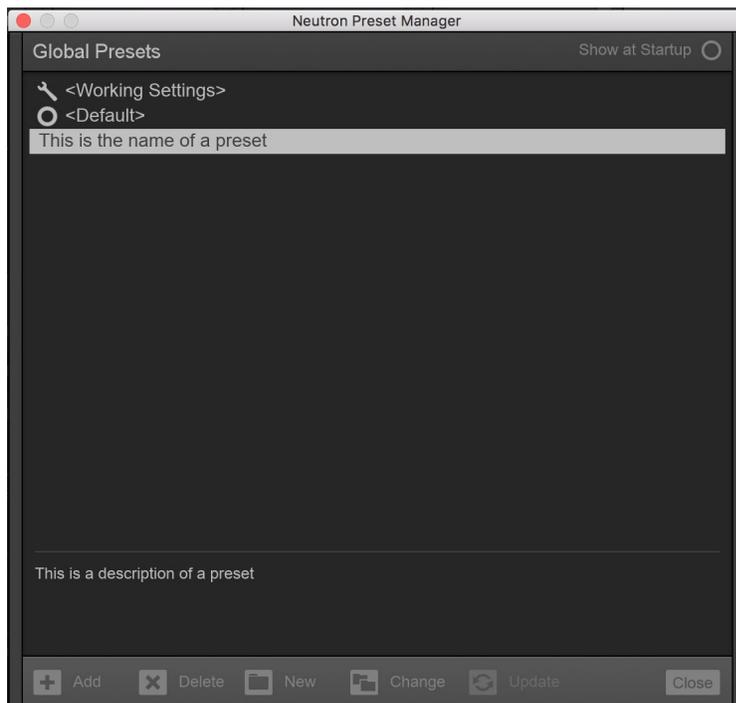
HOST	FORMAT	CHANNEL CONFIGURATION
Pro Tools	<ul style="list-style-type: none">• Film	<ul style="list-style-type: none">• 1.0• 2.0• 3.0 (LCR)• 4.0 (Quad)• 5.0• 5.1• 7.0• 7.1
Logic Pro	<ul style="list-style-type: none">• DTS• ITU/SMPTE• SDDS	<ul style="list-style-type: none">• 1.0• 2.0• 4.0 (Quad)• 4.0 (LCRS)• 5.1 (ITU/SMPTE)
Cubase	<ul style="list-style-type: none">• ITU/SMPTE	<ul style="list-style-type: none">• 1.0• 2.0• 3.0 (LRC)• 3.0 (LRS)• 4.0 (Quad)• 4.0 (LCRS)• 5.0• 5.1
Nuendo	<ul style="list-style-type: none">• DTS• ITU/SMPTE• SDDS	<ul style="list-style-type: none">• 1.0• 2.0• 4.0 (Quad)• 4.0 (LRCS)• 5.0• 5.1• 7.0 (cine)• 7.0 (music)• 7.1 (cine)• 7.1 (music)



LFE rolloff filter

If you happen to be mixing to a surround-sound spec that requires a band-limited LFE signal, the 24 db/octave LFE rolloff filter helps you achieve this. Access this filter in the Options Menu/Metering, where you'll be able to enable the filter and select the cutoff value. (This feature is only visible when using Neutron in 5.1 or 7.1.)

Using the Preset Manager



Neutron ships with hundreds of presets, covering both common and creative use cases for all manner of music and post-production scenarios. Clicking the Preset Manager button or clicking the text displaying “Presets” brings up the Preset Manager window. Clicking on any preset in the list will immediately apply the associated parameters to all of the controllers in the Neutron plug-in.

Working Settings

If you decide not to use a preset and would like to apply the last settings used that were not associated with a preset, you can select “Working Settings.”



Default

Select “Default” to reset all parameters to their initial state when first instantiating the Neutron plug-in.

Preset Information

Below the list of presets in the Preset Manager, you can find some text detailing the parameter settings associated with the selected preset.

If you select a preset and change any parameters in the plug-in, the preset name in the Preset Manager’s list will have an asterisk before it. This simply indicates that your current settings differ from those associated with the preset as it was last saved. Simply click the preset name in the Preset Manager list once to return your plug-in parameters to the saved state of the associated preset.

Adding And Removing Presets

The Preset Manager includes methods for creating new presets, creating new folders, and deleting presets.

To create a new preset:

1. Set the parameters in Neutron to the values you wish to save and open the Preset Manager (as described above). You can click “Working Settings” in the Preset Manager to confirm that the settings of the plug-in are set to match your expectations of what should be saved in the preset.
2. Click the “New Preset” button in the Preset Manager. You will be prompted with an edit box to enter a name for this new preset. This will create a new preset with the parameters saved from the “Working Settings,” and will save to the same location as all Neutron presets (see “Preset storage location” below).
3. If you are in a subfolder or have a subfolder selected in the Preset Manager, your new preset will be created within that subfolder, rather than at the top level of the preset directory. This preset can then be used in your workflow as you would any other preset. If you so choose, you can give your preset a custom comment by clicking the text that says “Click here to comment.”
4. For better organization, the Preset Manager also allows you to create a new folder in which to place any preset. To do this, click the “New Folder” button in the Preset Manager. You will be prompted to give the folder a name. To move any preset or even any folder into another folder in the Preset Manager, click and drag the preset or folder you want to move, place it in the expanded folder, and release the mouse.



To rename any item in the Preset Manager, click twice on the preset name or folder to bring up an edit box.

To delete any item in the Preset Manager, select the item and click the “Delete” button. A dialog box will appear to confirm your choice.

Preset Storage Location

The presets used in Neutron are stored on disk:

- **Windows:** C:\Users\<>your_user_name>\Documents\iZotope\Neutron\Global Presets
- **Mac:** /Users/<your_user_name>/Documents/iZotope/Neutron/Global Presets

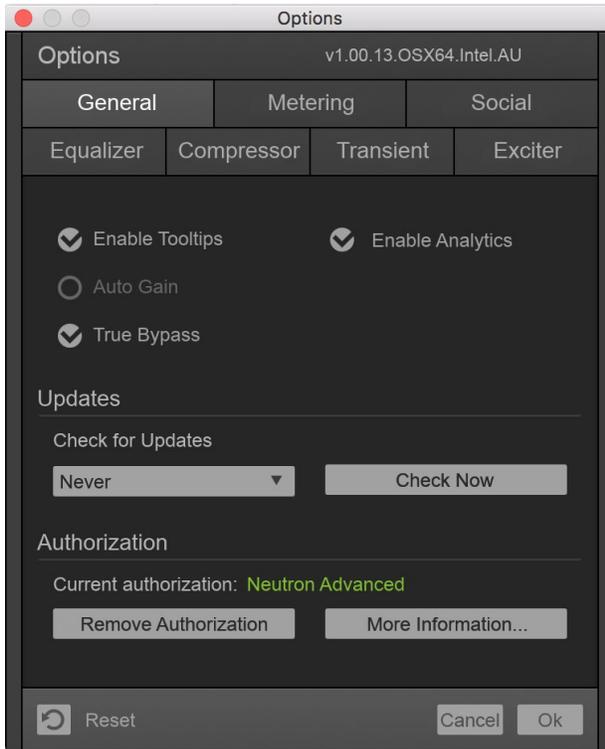
This folder contains the presets included with the installation and any custom presets you have added via the Preset Manager. Keep in mind that factory defaults can be restored by deleting the Presets folder and reinstalling the Neutron plug-in.

Distributing Presets

As these presets are saved as .xml files on your hard drive, you may create and save presets, then distribute them across an entire organization or facility that may benefit from using the same settings.

Options Menu

General



ENABLE TOOLTIPS

This allows you to toggle off tooltips should you find them distracting, or enable them should you desire the guidance and information on any parameter you mouse over.

AUTO GAIN

When Neutron is on, there are many modules such as the multiband Dynamics and Equalizer, that can affect the overall or perceived loudness of the mix. This makes it very hard to compare “Neutron on” to “Neutron bypassed.”

The “Automatically Match Effective Gain When Bypassed” feature solves this problem. Neutron determines how much perceived gain is being added by all of the active Neutron modules and then automatically adds this amount of gain when Neutron is put into bypass mode. You can bypass Neutron, or any individual module, and the gain is automatically adjusted so that when you A/B Neutron on and off, the apparent volume is the same.



This gain processing is the only processing that is applied when Neutron is bypassed, and it is of course only applied when Neutron is actually bypassed. (This feature won't work when True Bypass is enabled.)

TRUE BYPASS

Click this box to allow Neutron to disengage a module's latency when that module is bypassed. This results in a click as the audio transitions, but avoids unnecessary latency compensation and CPU usage.

ENABLE ANALYTICS

Click this box to allow Neutron to occasionally upload data on your usage patterns of the plugin to iZotope's servers. This info is completely anonymous, and allows us to better understand how users use Neutron in order to provide the best updates possible in the future.

UPDATES

Neutron allows you to check for updates from iZotope with recurring frequency. Check Now is an instant check, but you can also define periodic, automatic checks.

These options are:

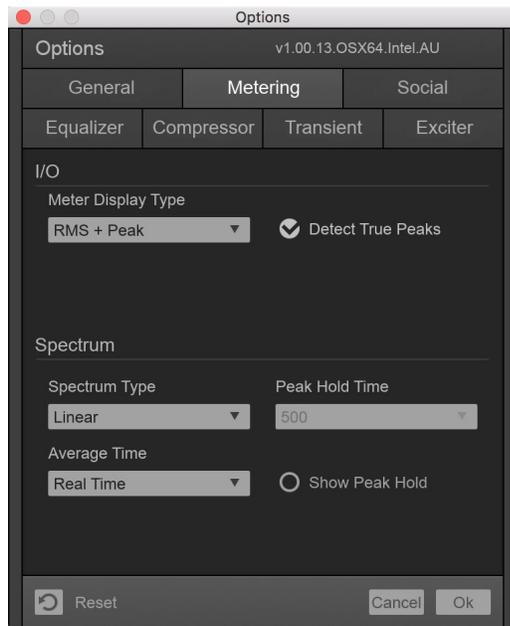
- Never
- Daily
- Weekly
- Monthly

AUTHORIZATION

This section allows you to authorize and deauthorize Neutron. Clicking on "Authorize" will load the authorization window discussed in detail in the earlier chapter. Clicking on "Remove Authorization" will remove the authorization from your machine to facilitate transfer to another computer. This is specific to local authorizations and will not affect iLok.

Clicking on "More information..." will take you to the authorization help section of iZotope's website.

Metering



METER TYPE

This allows you to switch Neutron’s metering between a Peak+RMS combo meter and a Peak+Short-term loudness combo meter.

The combined Peak+RMS meter displays a lower bright bar representing the average level (RMS) and a higher dimmer bar representing peak level. There is also a moving line above the bar representing the most recent peak level or peak hold.

Short-term loudness is a level measurement used originally in audio post production, but now much is used in music production as well due to it being a much more perceptually accurate measure of volume than RMS. It is a calculation of loudness over the course of a moving window of three seconds. This measurement is useful in monitoring immediate trends of loudness in your audio.

DETECT TRUE PEAKS

By default the Input/Output meters will only indicate clipping which occurs within the digital domain. To accurately measure the signal that will result from digital to analog conversion, select “Detect True Peaks.”



SPECTRUM TYPE

This feature lets you select between four types of spectrums:

- **Linear:** A continuous line connecting the calculated points of the spectrum.
- **1/3 Octave:** Splits the spectrum into bars with a width of 1/3 of an octave. Although the spectrum is split into discrete bands, this option can provide excellent resolution at lower frequencies.
- **Critical:** Splits the spectrum into bands that correspond to how we hear, or more specifically how we differentiate between sounds of different frequencies. Each band represents sounds that are considered “similar” in frequency.
- **Full Octave:** Splits the spectrum into bars with a width of one full octave.

AVERAGE TIME

This feature averages the spectrum according to this setting. Higher average times can be useful for viewing the overall tonal balance of a mix, while shorter average times provide a more real-time display.

SHOW PEAK HOLD

This shows or hides the peak hold in the audio spectrum behind the EQ. Note this is different to the level meters.

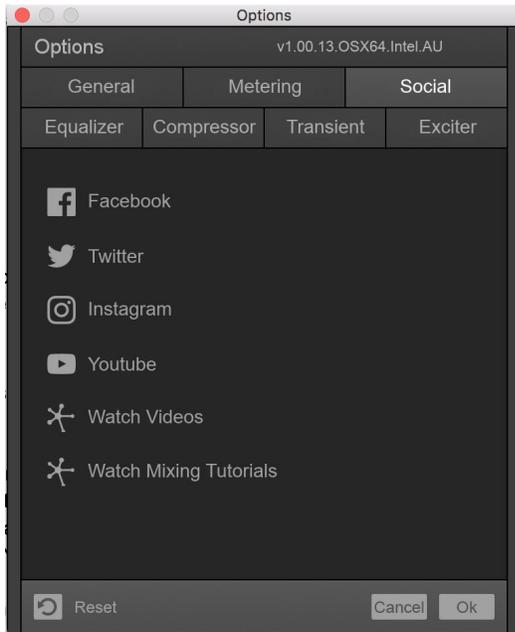
PEAK HOLD TIME

Peak hold time determines how long peaks are displayed after they are detected.

Choices include:

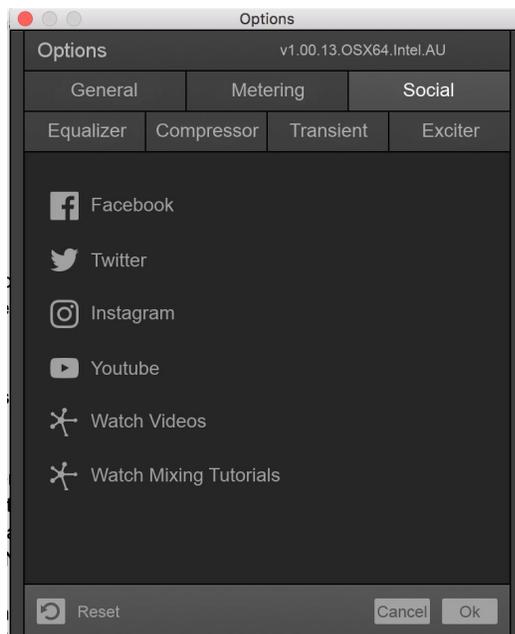
- 5 ms
- 250 ms
- 500 ms
- 1,000 ms
- 5,000 ms
- Infinite

Social



This tab links you to iZotope’s social media networks, as well as a few other online areas that contain useful educational content.

Equalizer





SHOW SPECTRUM

Check this box to display a real-time spectrum analyzer signal underneath the Equalizer curve. This can be very useful in showing the frequency balance of your mix and how it is changed as you apply equalization.

SHOW MUSICAL UNITS

When this setting is checked, it allows you to display frequency labels as notes (for example, A4) in addition to the conventional EQ measurement of Hz.

SPECTRUM FREQUENCY SCALE

Allows you to adjust the scale of the EQ frequency spectrum.

ALT-SOLO Q

Sets the bandwidth (Q) of the Alt-Solo Feature, which allows you to solo bands and sweep through the spectrum when holding Alt and left-clicking.

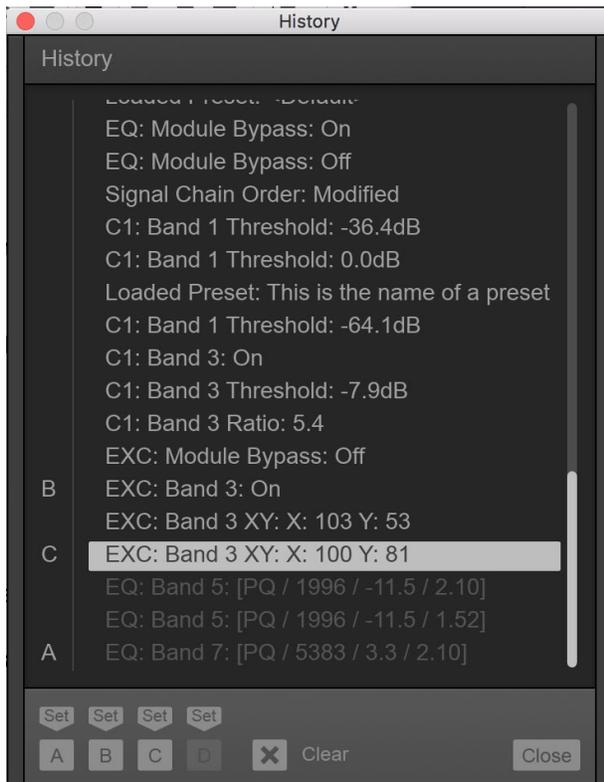
This tab also contains the Masking Meter Collision Histogram peak time and Gain Offset, each of which is explained in the masking chapter.

Compressor / Transient / Exciter

Each of these tabs allows you to choose which type of crossover you so desire for that module's multiband processing.

- The analog, zero-latency crossover option provides a natural analog character at the expense of some phase distortion.
- The hybrid, transparent crossover is a perfect reconstruction IIR analog crossover designed to reduce phase distortion and frequency distortion found in other analog crossovers while maintaining the efficiency and the warm characteristics of analog crossovers.

UNDO HISTORY



The Undo History window is a unique and powerful feature for comparing settings in Neutron. To access the History list, click on the “History” button in the top menu bar of the plug-in. As you tweak controls, each movement is captured and displayed in the History list.

To go back and hear a previous setting, simply click on the list at the point you want to audition. The changes that you’ve undone will show up in a lighter color.

CLEAR BUTTON

Click the “Clear” button to clear the history list at any time.

CLOSE BUTTON

Click the “Close” button to close the History window. Processing resumes from the point you had last selected, so you can continue building on the History list from an earlier point.



A, B, C, AND D BUTTONS

You can assign up to four points in the History list to A, B, C, and D buttons. This is useful for A/B'ing many different settings all at once. To do so:

- Select the point in the list you want to capture
- Click on the “Set” button below the A, B, C, or D button.
- Clicking on the appropriate button will then recall the setting assigned to that button.

If you've been with us since the beginning, and have read this far in the manual, we salute you. As part of our look into Neutron's General Functions, here are a few humble words of advice to consider as you mix:

- **Mixing:** To avoid over-processing, use the Mix sliders to blend in some dry signal.
- Intelligent settings, such as those delivered by Track Assistant, are not final settings.
- **Compression:** Start with one, and add more bands if needed.
- **Hybrid EQ:** While EQ'ing, use two Dynamic EQ nodes to compress the sibilant areas.
- Analysis can be great — but it has to sound good too, so don't forget to A/B.
- **Exciter blends:** Try balancing Tube/Tape on vocals or Tape/Retro on electric guitars.
- **Limiters in post production.** IRC LL is our favorite True Peak, low-latency algorithm to use.
- **Balanced mixes:** Start in mono, setting gain, then EQ, then panning to stereo.
- Unmask a mix by comparing all other tracks against the lead vocal.
- Ratios are important. High ratios may suck the life out of a mix.
- Kick drum and bass drum relationships, are a bedrock of any groove.
- Equalizer's “Learn” potentially problematic areas in a signal.



AUTHORIZATION

Authorization is required to disable both Trial and Demo modes.

Trial mode

For the 10 days after Neutron is first opened or instantiated, Neutron will run in Trial mode. Trial mode offers the full functionality of Neutron.

Demo mode

After 10 days, Neutron will go into Demo mode. In Demo mode, Neutron inserts silence at intervals.

Serial number

Each purchased copy of Neutron contains a unique serial number to authorize your product.

If Neutron has been downloaded directly from iZotope or another reseller, the serial number will be emailed to you, along with the link to download the product. The serial number should resemble:

SN-NEUTRON-XXXX-XXXX-XXXX-XXXX

Or

SN-NEUTRONADV-XXXX-XXXX-XXXX-XXXX

Instructions on how to use this serial number to authorize are outlined in this chapter.

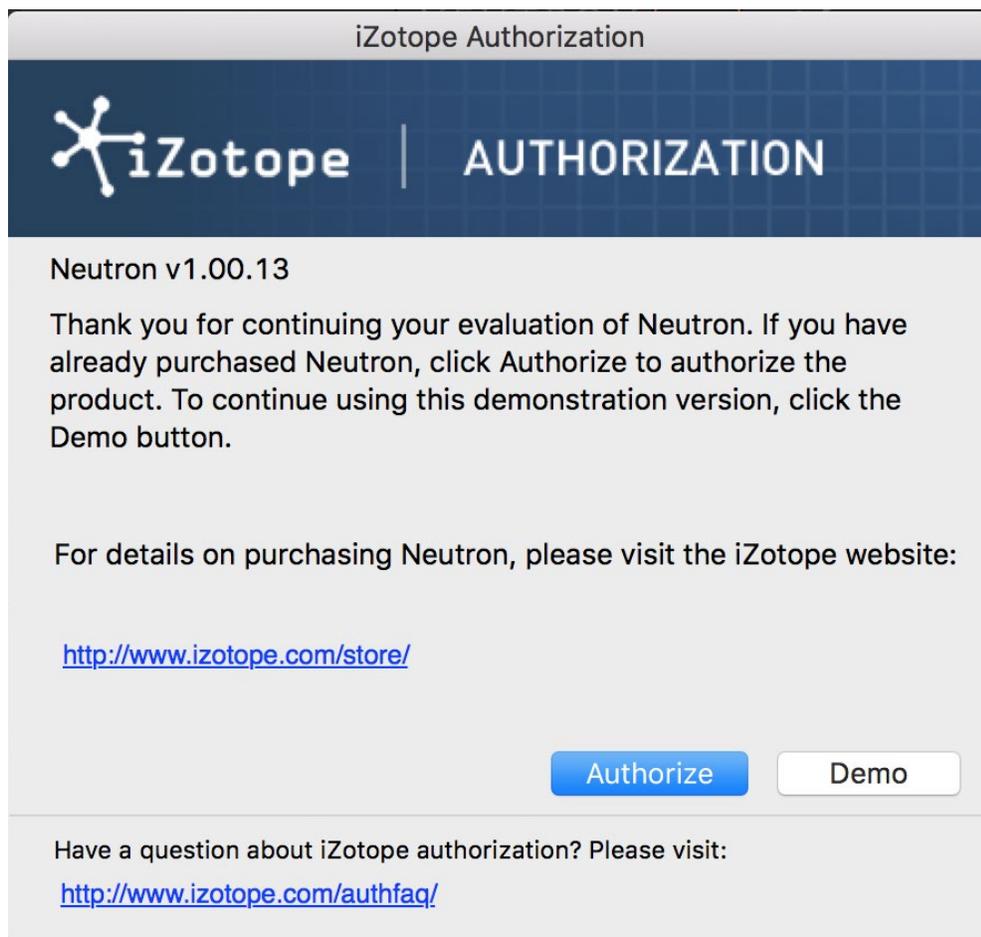


Authorizing your copy of Neutron online

Launching the Authorization Wizard

The first time you open the Neutron plug-in, the Authorization Wizard will appear.

You can choose to either click “Authorize” to authorize Neutron, or instead click “Continue to use it in Trial mode” for evaluation purposes. If you’ve purchased Neutron, please use your supplied Neutron serial number to fully authorize your product.



After opening Neutron and launching the Authorization Wizard, perform the following steps to complete the authorization process online:

1. Click “Authorize.”

iZotope Authorization

iZotope | AUTHORIZATION

Please enter the following information:

Serial Number: ?

Name:

E-mail:

Country: ▾

Subscribe to the iZotope newsletter

Use iLok authorization

iLok ID: ?

Not connected to the Internet? You can use offline authorization.

Have a question about iZotope authorization? Please visit:
<http://www.izotope.com/authfaq/>

2. Enter the serial number, using all capital letters, as it is shown in the purchase confirmation email. For example: SN-NEUTRONADV-XXXX-XXXX-XXXX-XXXX
 - You must also enter your name and a valid email address.
 - Note: Clicking the Advanced button reveals a set of options that allow you to store your Neutron authorization on a portable hard drive or flash drive. More detail can be found at www.izotope.com/en/support/authorization/.
3. Please make note of the email address you use to authorize your license, as your license and iZotope account will be linked directly to this email address.
4. When you have confirmed that your serial number and email information is accurate, click once more on “Authorize.”
5. Click “Submit” to send your authorization information to iZotope.
6. Once the authorization is accepted, click “Finish” to complete the authorization.



Authorizing your copy of Neutron offline

Some customers choose to keep their audio workstations offline; for these instances, a simple offline authorization option has been included.

After opening Neutron and launching the Authorization Wizard, the following steps will complete the authorization process offline:

1. When first prompted to authorize Neutron, click “Authorize.”
2. Click “Offline Authorization” at the bottom of the authorization window.
3. You will be given a unique Challenge Code that is specific to your computer only.
 - Write down or make a copy of the exact Challenge Code. It will look like this:
IZ-Neutron-XXXXXXXX-XXXX-XXXX
4. Next, using a system with Internet access, log in to your customer account at the iZotope website: www.izotope.com/en/account/log-in/.
5. Click “Activate Software with a Serial Number,” enter your full serial number, then click “Submit.”
6. Select the “Challenge/Response” option and click “Submit.”
7. Enter your full Challenge Code copied in Step 3.
8. After submitting your Challenge Code, you will receive a unique authorization file named “iZotope_Neutron_XXXXX.izotopelicense.” Copy this file to your offline computer.
9. Once the authorization file is copied to your offline computer using a network, hard drive, or USB thumb drive, click the “Choose File...” button in your authorization wizard.
10. Navigate and select the authorization file and click “Next” to authorize your machine.
11. You should now receive a message that your authorization has been successful; you may click “Finish” to begin using Neutron.

iLok Support

Neutron supports the iLok copy protection system.

The plug-in will be able to detect iLok keys and assets if you already use iLok and PACE software on your system.

If you don’t already have PACE or iLok, we will not install any PACE or iLok software to your system, and iLok authorizations will be unavailable.



Authorizing Neutron with iLok

1. When first prompted to authorize Neutron, click on “Authorize.”
2. Next, enter the serial number in all capital letters as it is shown on the included card or purchase confirmation email.
 - This would look something like: SN-NEUTRONADV-XXXX-XXXX-XXXX-XXXX
3. You must also enter your name and a valid email address. Make note of the email address you use to authorize your license. Your license and iZotope account will be linked directly to this email address.
4. Select “Use iLok Authorization” and enter your iLok ID.
5. When you have confirmed that all your information is accurate, click once more on “Authorize.”
6. Lastly, click “Submit” in order to send your authorization message to the iZotope servers.
7. You will now be instructed to log in to your iLok account and transfer your Neutron license to your iLok.
8. When you have completed this step and have your iLok connected to the computer on which you want to use Neutron, click “Next.”
9. You should now receive a message that your authorization has been successful and may click “Finish” to begin using Neutron.

Removing your current authorization

If you need to move your license to an additional machine(s), use the Remove Authorization button in the Neutron’s Options menu to remove your current Neutron authorization.

After removing your authorization, Neutron’s authorization screen will pop up when you restart the program. Now you can re-authorize using a new serial number. You may also remove your authorization at any time in order to run in Trial or Demo mode.

How to contact iZotope Customer Care

For additional help with authorizing Neutron:

- Check out the Customer Care pages on our web site at www.izotope.com/support.
- Contact our Customer Care department at support@izotope.com.

More information on iZotope’s Customer Care department and policies can be found in the iZotope Customer Care section.



IZOTOPE CUSTOMER CARE

How to purchase the full version of Neutron

If you are using the Demo version of Neutron and would like the full version, you can purchase Neutron direct from the iZotope online store, located at: www.izotope.com/store.

Once your purchase is complete, you will be sent an email confirmation and a full-version serial number that can be used to fully authorize your current installation of Neutron.

iZotope Customer Care policy

iZotope is happy to provide professional technical Customer Care to all registered users, absolutely free of charge.

We also offer valuable pre-sales technical Customer Care to customers who may be interested in purchasing an iZotope product. Before contacting iZotope Customer Care, you can search our Product Knowledgebase to see if the solution to your problem has already been published.

How to contact iZotope Customer Care for technical support

For additional help with Neutron:

- Check out the Customer Care pages on our web site at www.izotope.com/support.
 - Contact our Customer Care department at <https://support.izotope.com/>.
- 



iZotope's highly trained Customer Care team is committed to responding to all requests within one business day and frequently responds faster. Please try to explain your problem with as much detail and clarity as possible. This will ensure our ability to solve your problem accurately, the first time around. Please include all system specs and the build/version of Neutron that you are using.

Once your Customer Care request is submitted, you should automatically receive a confirmation email from iZotope Customer Care. If you do not receive this email within a few minutes please check your spam folder and make sure our responses are not getting blocked. To prevent this from happening, please add support@izotope.com to your list of allowed email addresses.

International distribution

Customer Care is also available from our international distributors worldwide, for any customers who purchased their iZotope products through a certified iZotope distributor.

Check with your local distributor for their availability. If you would like help locating your local distributor, please contact iZotope Customer Care.



END USER LICENSE AGREEMENT

IZOTOPE, INC. SOFTWARE LICENSE AGREEMENT

THIS IS A LEGAL AGREEMENT BETWEEN YOU AND IZOTOPE, INC. (“IZOTOPE”). READ THIS AGREEMENT CAREFULLY BEFORE YOU CLICK ON THE “I ACCEPT” OPTION BELOW. BY CLICKING ON THE “I ACCEPT” OPTION, YOU AGREE THAT YOU HAVE READ AND UNDERSTAND THIS AGREEMENT AND WILL BE BOUND BY ITS TERMS AND CONDITIONS.

SOFTWARE. “Software” means the iZotope executable software product accompanying this Agreement, along with any modules, presets, and/or user documentation.

LICENSE. Subject to all the terms and conditions of this Agreement, you (a natural person) may use the Software either on a stand-alone computer or on a network, on any one computer at any one time. If more than one user will be using the Software at any one time, you must obtain from iZotope an additional license for each additional concurrent user of the Software. The Software is “in use” on a computer when loaded into memory (RAM). You may make one copy of the Software solely for backup or archival purposes if all copyright and other notices are reproduced on that copy, or you may copy the Software to a single hard disk provided you keep the original solely for backup or archival purposes. If the Software is an upgrade, you must have a license for the product from which it is upgraded. If you receive the Software in more than one media form, that does not affect the number of licenses you are receiving or any other term of this Agreement.

OWNERSHIP. The Software and all intellectual property rights therein (including copyrights, patents, trade secrets, trademarks, and trade dress) are owned by iZotope or its suppliers and are protected by the laws of the United States and other countries and by international treaty provisions. iZotope retains all rights not expressly granted in this Agreement.

OTHER RESTRICTIONS. You may not modify, adapt, decompile, disassemble or otherwise reverse engineer the Software, except to the extent this restriction is expressly prohibited by applicable law. You may not loan, rent, lease, or license the Software, but you may permanently transfer your rights under this Agreement provided you transfer this Agreement, all Software, and all accompanying printed materials and retain no copies, and the recipient agrees to the





terms of this Agreement. Any such transfer must include the most recent update and all prior versions.

LIMITED WARRANTY. iZotope warrants that, for a period of thirty (30) days from your date of receipt, the Software will substantially conform to the applicable user documentation provided with the Software. Any implied warranties which may exist despite the disclaimer herein will be limited to thirty (30) days. This Limited Warranty is void if you obtain the Software from an unauthorized reseller, you violate the terms of this Agreement, or if the failure of the Software is due to accident, abuse or misapplication. Some states/jurisdictions do not allow limitations on duration of an implied warranty, so this limitation may not apply to you.

CONFORMANCE TO STANDARDS. The Software may include features and presets to process audio to conform to various industry standards (for example, loudness standards promulgated in the audio production industry). While iZotope engineers have diligently worked to make the Software and presets accurately implement any such industry standards, iZotope can make no representation or warranty that the Software or presets will make audio correctly comply with any present or future standard.

YOUR REMEDIES. iZotope's sole obligation and your exclusive remedy for any breach of warranty will be, at iZotope's sole option, either the return of the purchase price you paid or, if you return the Software, together with all media and documentation and a copy of your receipt, to the location where you obtained it during the warranty period, the repair or replacement of the Software, media and documentation. Outside the United States, neither these remedies nor any support services are available without proof of purchase from an authorized non-U.S. source.

SUPPORT. Subject to the limited warranty stated above, and further subject to you not being in violation of any term of this Agreement, iZotope will provide email support for the Software to the original purchaser, for a period of 12 months from the original purchase date.

REGISTRATION INFORMATION. When you activate the Software, iZotope may collect your name and email address and other contact information you choose to provide. iZotope may use this information to contact you regarding upgrades and new products, and also to gather statistical data that does not identify individual users. iZotope does not collect or retain any financial information (such as credit card information).

USAGE INFORMATION. When you use the Software, iZotope may collect certain information about your computer and your interaction with the Software via the internet ("Usage Information"). Usage Information is information on how you interact with the Software, and is then utilized by iZotope for statistical analysis for improving the Software, and to provide you with a more relevant user experience. No direct personal information or audio files/samples are collected as part of this Usage Information. Usage Information is generally collected in the



aggregate form, without identifying any user individually, although IP addresses, computer and session ids in relation to purchases and downloads/installations of the Software may be tracked as part of iZotope's customer order review, statistical analysis, and fraud and piracy prevention efforts. This Usage Information may be sent to an iZotope web or third party cloud server for storage or further processing by iZotope and/or its partners, subsidiaries or affiliates, including, but not limited to, Google Analytics. The Software includes an opt-out provision if you do not wish to provide iZotope with such Usage Information.

DISCLAIMER. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IZOTOPE DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IZOTOPE DOES NOT WARRANT THAT THE SOFTWARE WILL MEET YOUR REQUIREMENTS OR THAT THE SOFTWARE WILL OPERATE UNINTERRUPTED OR ERROR-FREE. THE WARRANTY AND REMEDIES SET FORTH HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHERS, ORAL OR WRITTEN, EXPRESS OR IMPLIED. The Limited Warranty set forth herein gives you specific legal rights, and you may have others under applicable law, which may vary depending on your location. No dealer, distributor, agent or employee of iZotope is authorized to change or add to the warranty and remedies set forth herein. Any other software furnished with or accompanying the Software is not warranted by iZotope.

LIMITATION OF LIABILITY. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IZOTOPE WILL HAVE NO LIABILITY FOR ANY DAMAGES WHATSOEVER ARISING OUT OF THE USE OF OR INABILITY TO USE THE SOFTWARE (INCLUDING, WITHOUT LIMITATION, DAMAGES OR COSTS FOR LOSS OF PROFITS, BUSINESS, GOODWILL, DATA OR OTHER ASSETS, OR COMPUTER PROGRAMS) EVEN IF IZOTOPE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT WILL IZOTOPE BE LIABLE FOR ANY AMOUNTS EXCEEDING THE AMOUNTS RECEIVED FROM YOU FOR YOUR LICENSE OF THE SOFTWARE. Some jurisdictions do not allow exclusion or limitation of liability for consequential or incidental damages, so this limitation may not apply to you.

TERMINATION. The Agreement will terminate automatically if you fail to comply with any of its terms. On termination, you must immediately cease using and destroy all copies of the Software.

LICENSES TO U.S. GOVERNMENT. This paragraph applies to all acquisitions of the Software by or for the federal government, or by any prime contractor or subcontractor (at any tier) under any contract, grant, cooperative agreement or other activity with the United States government (collectively, the "Government"). By clicking "I ACCEPT" below, you are agreeing on behalf of the Government that the Software is "commercial computer software" and "commercial computer software documentation" within the meaning of the acquisition regulation(s) applicable to this procurement. These terms and conditions alone will govern the Government's use of the Software and will supersede any conflicting contractual terms or conditions. If the



license granted by these terms and conditions fails to meet the Government's needs or is inconsistent in any respect with Federal law, the Government must return the Software unused to iZotope. Contractor/Manufacturer is iZotope, Inc., 60 Hampshire Street, Cambridge, MA 02139.

GENERAL. The export of the Software from the United States and re-export from any other country is governed by the U.S. Department of Commerce under the export control laws and regulations of the United States and by any applicable law of such other country, and the Software may not be exported or re-exported in violation of any such laws or regulations. This Agreement is the complete and exclusive statement of the agreement between you and iZotope and supersedes any proposal or prior agreement, oral or written, and any other communications relating to the subject matter of this Agreement. This Agreement is in the English language only, which language will be controlling in all respects, and all versions of this Agreement in any other language will be for accommodation only.

LEGAL. This Agreement will be governed by and interpreted under the laws of the Commonwealth of Massachusetts, United States of America, without regard to conflicts of law provisions; however, if you acquired the Software outside the United States, local law may override this sentence and apply instead. The application of the United Nations Convention of Contracts for the International Sale of Goods is expressly excluded. To the extent permitted by law, you agree that no lawsuit or any other legal proceeding connected with the Software shall be brought or filed by you more than one (1) year after the incident giving rise to the claim occurred. IN ADDITION, ANY SUCH LEGAL PROCEEDING SHALL NOT BE HEARD BEFORE A JURY. EACH PARTY GIVES UP ANY RIGHT TO A JURY TRIAL. To the extent permitted by law, you agree that you will not bring any class action lawsuit against iZotope or be a representative plaintiff or plaintiff class member in any such lawsuit.

Should you have any questions about this Agreement or iZotope's software use policies, or if you desire to contact iZotope for any other reason, in the U.S., please email sales@izotope.com; outside the U.S., please contact the iZotope representative or affiliate serving your country or, if you are unsure whom to contact, iZotope at the above location.