



RAUM

RAUM Manual

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2. WELCOME TO RAUM

RAUM is part of Native Instruments' KOMplete Instruments & Effects series. It is used as a plug-in in your host and offers a unique take on reverb effects. Its three reverb algorithms are optimized for a vast range of reverb sounds, from tight ambiences to otherworldly soundscapes. Therefore, you can use RAUM as a subtle mixing tool but also for creative sound design.

The predelay section includes a carefully tuned feedback function that opens the plug-in up to uses as an echo, a resonator, and even a basic looper. Combined with the reverb algorithms, this allows you to explore spatial effects that go beyond the scope of common reverb plug-ins. Further adding to RAUM's deep sound design capabilities, the Freeze function holds the sound content of the reverb infinitely, which turns the effect into a sound generator in its own right.

All controls are designed to provide smooth operation and a high level of playability, with a focus on sweet spots and meaningful interactions between parameters. For this reason, RAUM excels when used with heavy automation and as part of live performances. Its flexibility and playability allow you to explore reverb in a fun and exciting way.



Learn more about RAUM, its development, and reverb effects in general here: [Inter-view about RAUM](#).



3. DOCUMENT CONVENTIONS

This document uses particular formatting to point out special facts and to warn you of potential issues. The icons introducing the following notes let you see what kind of information can be expected:



The speech bubble icon indicates a useful tip that may help you to solve a task more efficiently.



The exclamation mark icon highlights important information that is essential for the given context.



The warning icon warns you of serious issues and potential risks that require your full attention.

Furthermore, the following formatting is used:

- Paths to locations on your hard disk or other storage devices are printed in *italics*.
- Important names and concepts are printed in **bold**.
- Square brackets are used to reference keys on a computer's keyboard, e.g., Press [Shift] + [Enter].

4. ABOUT REVERB EFFECTS

Reverb is a classic audio effect that simulates the acoustic properties of differently sized spaces, like rooms and halls. It has traditionally been used to add a sense of space to dry studio recordings, but its creative uses have also defined and spawned musical genres: from the iconic sound of gated reverb used on snare drums in 80s pop music, to psychedelic effects in dub music, to the cosmic sound of ambient.

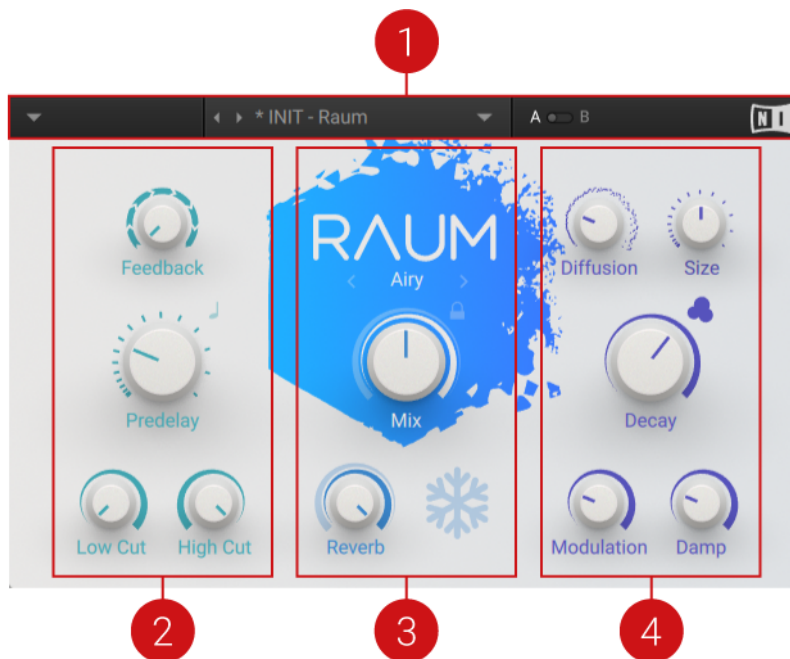
Early devices used mechanical means to achieve the reverb effect, for example by exciting sheets of metal (plate reverb) or springs and picking up the vibrations of the material. Later, digital technology allowed the implementation of algorithms that model the reflection patterns in an acoustic space with increasing accuracy. Today, reverbs provide convincing simulations of real spaces, but also make it possible to explore sounds beyond what is physically possible.

RAUM bridges the gap between the different use cases by combining flexible reverb algorithms with special features like predelay feedback, the Freeze function, and lush modulation. Further expanding on the traditional notion of a reverb effect, it is designed to respond well to realtime control, whether it be in a performance situation or when automated in the DAW.

5. OVERVIEW OF RAUM

The user interface of RAUM provides a clear overview of all parameters by grouping them in three sections: On the left side, you can adjust parameters related to the initial processing of the input signal, including predelay and equalization. In the center, you can find global controls for selecting the reverb algorithm, setting the effect amount, and activating the Freeze function. On the right side, you can tweak the selected reverb algorithm in detail. The header at the top allows you to save and load presets as well as change the plug-in settings.

The following overview shows the basic structure of the effect:



(1) **Header:** Provides global functions related to preset management and plug-in behavior. For more information, see [Header and Presets](#).

(2) **Predelay and Filter:** Parameters related to the initial processing of the input signal. You can adjust the timing of the reverb's onset with **Predelay** or use it in combination with **Feedback** for echo effects. The **Low Cut** and **High Cut** filters allow you to adjust the overall tone of the effect as well as the predelay's delay repetitions. For more information, see [Predelay and Filters](#).






(3) **Global controls:** Parameters related to the basic behavior of the effect. You can select one of three different reverb algorithms that cover a vast range of reverb sounds and can be further edited in the right side of the plug-in (4). The **Mix** and **Reverb** parameters adjust the global effect amount and the reverb amount, respectively. The **Grounded** and **Airy** algorithms additionally offer the Freeze function that holds the reverb's sound content for as long as the it is activated. For more information, see [Global Controls and Freeze](#).

(4) **Reverb algorithm:** Parameters specific to the selected reverb algorithm. You can change the length of the reverb (**Decay**) as well as control the consistency (**Diffusion**) and distribution (**Size**) of the reflections. **Modulation** adjusts the amount of movement applied to the reverb effect, while **Damp** adjusts the tonal quality of the sound. For more information, see [Reverb Algorithms](#).

6. CONTROL ELEMENTS

RAUM's user interface features a number of different controls. The following overview explains how to interact with them using a mouse.

Table 1. Control Elements

| Name | Image | Description | Key Commands |
|----------------|---|--------------------------------------|--|
| Knob control |   | Used to adjust effect parameters. | <ul style="list-style-type: none"> • Mouse click + drag up/down changes the control's value. • [Shift] + mouse click + drag up/down changes the control's value in fine increments. • [Ctrl] + mouse click sets the control to its default value. • Double mouse click sets the control to the value loaded from the preset or host project. |
| Button control |   | Used to switch functions on or off. | <ul style="list-style-type: none"> • Mouse click toggles between the control's active and inactive state. |
| Mode selector |  | Used to select one of several modes. | <ul style="list-style-type: none"> • Mouse click on the left and right arrows steps through the available modes. • Mouse click on the shown mode opens a drop-down menu for mode selection. |

7. HEADER AND PRESETS

The header provides global functions related to preset management and plug-in behavior.

It consists of the following menus and settings:



(1) **Settings menu:** Provides you with options for managing user presets and adjusting the plug-in's visual appearance. For more information, see [Settings Menu](#).

(2) **Preset menu:** Allows you to access all factory and user presets. For more information, see [Loading Presets](#).

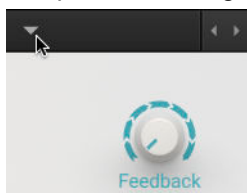
(3) **A/B Comparison switch:** Allows you to compare two sets of settings, called **A** and **B**. For more information, see [Comparing Parameter Settings](#).

(4) **NI logo:** Opens the About screen, which shows the version number of the software.

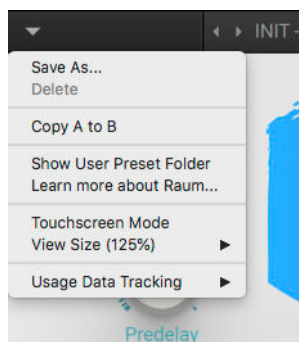
7.1. Settings Menu

The Settings menu in the header provides you with options for managing user presets, adjusting the plug-in's visual appearance, and copying settings of the A/B Comparison switch. You can also use it to access learning resources online and activate or deactivate usage data tracking.

- To open the Settings menu, click on the arrow symbol on the left side of the header.



The following entries are available in the Settings menu:



- Save As...:** Saves the current settings as a user preset in the User Preset folder. For more information, see [Managing User Presets](#).

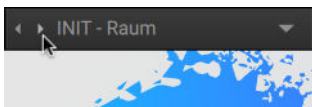
- **Delete:** Deletes the current user preset from the User Preset folder. For more information, see [Managing User Presets](#).
- **Copy A to B / Copy B to A:** Copies parameter settings saved in the A/B Comparison switch from the active to the inactive slot. For more information, see [Comparing Parameter Settings](#).
- **Show User Preset Folder:** Opens the User Preset folder in a new window. For more information, see [Managing User Presets](#).
- **Learn more about Raum...:** Opens the Native Instruments website where you can download the RAUM Manual.
- **Touchscreen Mode:** Enables compatibility with touch screens and pen tablets.
- **View Size:** Allows you to choose from five different sizes for the plug-in and save the current size as default value.
- **Usage Data Tracking:** Here you can learn more about Usage Data Tracking and choose to activate or deactivate it.

7.2. Loading Presets

RAUM is provided with a wide range of factory presets that make full use of its sonic capabilities. You can put them to use in your music right away, or explore their sound and settings to help familiarize yourself with the plug-in.

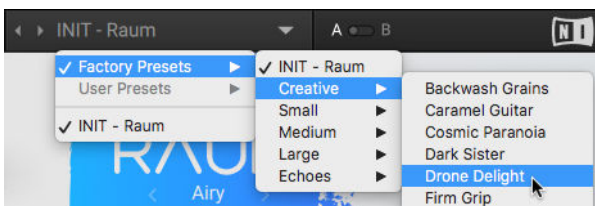
All presets can be loaded directly from the user interface by using the Preset menu, including your own user presets.

- Click the left and right arrows on the left side of the Preset menu to cycle through all presets and load them one after the other.



Alternatively, you can load presets from a list that is organized in categories.

- Click on the Preset menu to open a list of all available presets. Any preset can be loaded by selecting it from the list. Various categories of factory presets and user presets are available in separate submenus.



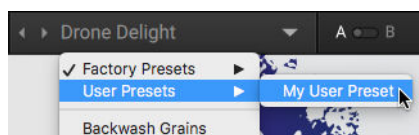
The **INIT** preset contains basic settings that are useful as a starting point for creating your own effect sounds.

7.2.1. Quick Access List

Below the Factory Presets and User Presets you'll find the Quick Access list. If you load a preset from the User Presets submenu, the next time you open the Preset menu the Quick Access list will show all user presets. If you load a preset from the Factory Presets submenu, the next time you open the Preset menu the Quick Access list will show all factory presets.

7.3. Managing User Presets

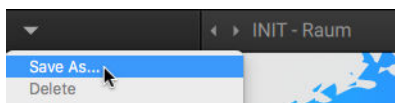
If you have created an effect sound you want to keep for later use, you can save it to the User Preset folder. All presets in the User Preset folder are available under User Presets in the Preset menu. This way you can always access your personal library of effect sounds directly from the user interface.



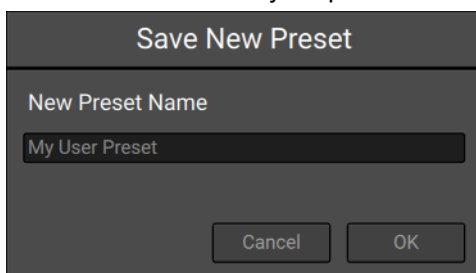
7.3.1. Saving a New User Preset

To save a user preset:

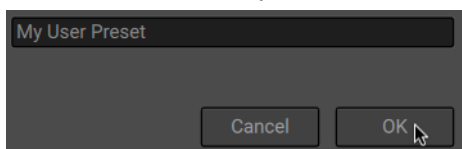
1. Open the Settings menu by clicking on the arrow symbol on the left corner of the header and select **Save as....**



2. Enter a new name for your preset in the **Save New Preset** dialog box.



3. Click **Ok** to finish the process and close the dialog box.



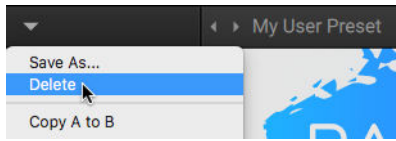
Your user preset is saved in the User Preset folder.

7.3.2. Deleting a User Preset

You can delete the current user preset via the Settings menu. Note that you cannot delete factory presets.

To delete the current user preset:

- Open the Settings menu by clicking on the arrow symbol on the left corner of the header and select **Delete**.



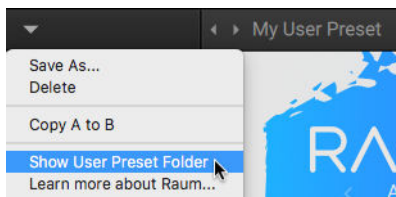
7.3.3. User Preset Folder

The User Preset folder contains all of your saved user presets. You can copy, delete or change the name of user presets directly in the folder on your hard drive.



The plug-in needs to be reloaded in order to reflect any changes made in the User Preset folder.

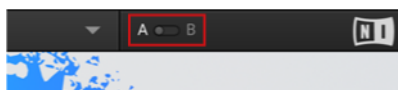
- To show the User Preset folder on your hard drive, open the Settings menu by clicking on the arrow symbol in the left corner of the header and select **Show User Preset Folder**.



A new window opens, showing the User Preset folder on your hard drive.

7.4. Comparing Parameter Settings

The A/B Comparison switch can help you to fine-tune your settings. It is located to the right of the Preset menu in the Header:



It features two temporary memory slots **A** and **B** that you can use to quickly switch between two sets of parameter settings. This makes it easy to compare different settings and find the ones you like.

To use the A/B Comparison switch:

1. Create an effect sound you like. All parameter settings are automatically saved to slot **A**.
2. Click on **B** to switch to the second slot. When you switch to slot **B** for the first time, it automatically takes over all the settings from slot **A**.
3. Adjust parameters to create an alternative effect sound. All settings are automatically stored in slot **B**.
4. Click **A** and **B** to switch between the two variations of your effect sound.

When you have found an effect sound you like, you can save the settings from the currently selected memory slot of the A/B Comparison switch as a preset. For more information about saving presets, see [Managing User Presets](#).



If you want to overwrite the settings saved in the other slot with the settings saved in the currently selected slot, open the Settings menu by clicking on the arrow symbol in the left corner of the Header and select **Copy A to B** or **Copy B to A**, respectively.

8. GLOBAL CONTROLS AND FREEZE

The controls grouped in the center of the plug-in define the basic behavior of the effect. Here you can choose from three unique reverb algorithms that cover a vast range of reverb sounds. The global **Mix** and dedicated **Reverb** amount allow you to adjust the strength of the effect, while the special Freeze function opens up new ways to interact with the effect for creative sound design.

By enabling the Freeze function (snowflake icon), you can create infinite washes of reverb. The function holds the reverb's sound content for as long as it is activated, effectively turning RAUM into a sound generator. Playing the function live or automating it allows you to grab different pieces of sound and use them as sonic ambience or for rhythmic effects, depending on how you play or automate it.



When the Freeze function is activated, only **Size** has an effect on the sound. To indicate this, the other reverb controls are greyed out. It is still possible to make adjustments, however they will only take effect once the Freeze function is disabled.

The global controls consist of the following parameters and settings:



(1) **Reverb algorithm:** Selects one of three different reverb algorithms, from rooms (**Grounded**), to halls (**Airy**), to abstract spaces (**Cosmic**). For more information, see [Reverb Algorithms](#).

(2) **Mix lock:** Locks the Mix control (3) to the currently set value when switching presets.

(3) **Mix:** Adjusts the amount of effect added to the input signal by means of an equal-power crossfade.

(4) **Reverb:** Adjusts the amount of reverb added to the effect signal by means of an equal-power crossfade.

(5) **Freeze**: Holds the reverb's sound content for as long as the function is activated. The Freeze function is available for the **Grounded** and **Airy** algorithms. Switching is optimized for smooth transitions without clicks, and you can still use the **Size** control to manipulate the sound. This makes the Freeze function an excellent tool for live performance and automation.

9. PREDELAY AND FILTERS

Predelay defines the timing of the reverb's onset by adding an initial delay to the reverb signal. RAUM's **Predelay** section sets itself apart from common reverb effects by adding feedback, which you can use to create echo effects. Additionally, **Predelay** can not only be set in milliseconds, but also in musical intervals synced to the host tempo. Therefore, you can use the predelay for rhythmic effects or to create synchronized echoes.

The feedback is optimized for a clean sound. Therefore it produces delay repetitions without any signal degradation. Additionally, a built-in limiter prevents excessive signal levels when an input signal is added to the delay repetitions. In this case, the input signal effectively ducks the delay sound.



By setting **Feedback** to 100%, you can use the predelay as a basic looper. The length of the loop is set using the **Predelay** control. When enabling the Predelay Sync function, you can set the loop length in musical intervals up to four bars (**64|4**).

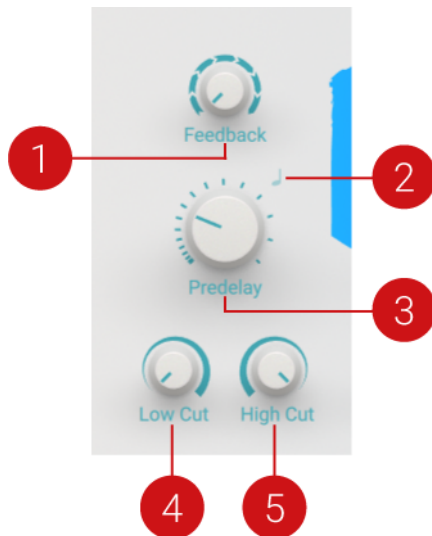
Combined with the reverb algorithms, it is possible to achieve unique spatial effects beyond classic echo and reverb. Since **Predelay** can be set in a wide range from below 1 ms to 2 seconds, you can fine-tune the reverb's onset as well as use the predelay for stretched-out repeater effects.



Comb filter sounds: By combining low **Predelay** with high **Feedback** values, you can use the predelay as a comb filter that adds a distinct tonal quality to the sound. The comb filtering effects are most obvious with sustained input signals. Percussive input signals can be used for resonator sounds similar to physical modelling. Adjust **Predelay** in fine increments to change the pitch of the tone. Automating **Predelay** produces flanging effects. You can use the **Airy** algorithm to add depth and texture to the sound. **Cosmic** allows for more extreme effects as it directly interacts with the predelay's feedback.

The **Low Cut** and **High Cut** filters allow you to adjust the overall tone of the effect by not only shaping the frequency contents of the reverb effect, but also the predelay's feedback signal. Therefore, delay repetitions are affected progressively. You can use this to create analog-style echo effects.

The Predelay section contains the following parameters:



(1) **Feedback**: Adjusts the level of the feedback signal from the output of the predelay to its input, effectively increasing the number of delay repetitions. Increasing the level of feedback creates echo effects that can be further processed using the selected reverb algorithm. When **Feedback** is set to 100%, you can achieve infinite delay repeats and therefore use the predelay as a looper. A built-in limiter controls the signal levels when high feedback settings are used with loud input signals.

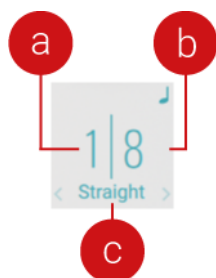


When **Predelay** (3) is set to 0 ms, **Feedback** does not have an effect on the sound. To indicate this, the control is greyed out. It is still possible to make adjustments, however they will only take effect once **Predelay** is set to a value other than 0 ms.

(2) **Predelay Sync**: Synchronizes the predelay to the host tempo and replaces the **Predelay** knob (3) with the Predelay Sync controls.

(3) **Predelay**: Adjusts the duration of the predelay, which is the time it takes for the reverb effect to set in. By increasing the predelay, you can add separation between the input signal and the reverb signal. This creates the impression of being closer to a sound source relative to the boundaries of a reverberant space. The duration ranges from below 0 ms to 2000 ms, which makes it possible to create resonator sounds at low settings, and extremely long echo or looper effects at high settings.

When Predelay Sync (2) is activated, the predelay is synchronized to the host and the **Predelay** knob is replaced by the Predelay Sync controls:



The Numerator (**a**) and Denominator (**b**) set the predelay in musical notes relative to the host tempo. The Numerator sets the number of notes, while the Denominator sets the note value. The Sync mode (**c**) sets the time value, or subdivision, for the chosen note value. For example, **1|4** in Sync mode **Straight** means that the predelay's duration equals one quarter note, and **3|2** in Sync mode **Triplet** means that the predelay's duration equals three half note triplets.

(4) **Low Cut:** Attenuates low-frequency content of the reverb effect and the predelay's feedback signal in the range of 0 dB to -24 dB by applying a low-shelf filter. Turning the control to the left decreases the attenuation. Turning the control to the right increases the attenuation. Turning the control fully to the left switches the filter off.

(5) **High Cut:** Attenuates high-frequency content of the reverb effect and the predelay's feedback signal by adjusting the cutoff frequency of a high-cut filter in the range of 90 kHz to 1 kHz. Turning the control to the left increases the attenuation. Turning the control to the right decreases the attenuation. Turning the control fully to the right switches the filter off.

10. REVERB ALGORITHMS

RAUM offers three different reverb algorithms that cover an extremely wide range of reverb sounds. Each of them is based on a different paradigm: **Grounded** focuses on rooms, **Airy** on halls, and **Cosmic** on abstract spaces. However, the individual parameters like **Size** and **Decay** are designed in such way that each of the algorithms can be used to create anything from tight ambiances to otherworldly soundscapes, while maintaining the basic character of its paradigm.

10.1. Grounded

Grounded is based on the paradigm of a room with strong early reflections and a dense reverb tail. The **Size** ranges from tiny ambiances to large chambers. At the higher end of its range it overlaps with the **Airy** algorithm, so it is possible to smoothly transition to the sound of larger reverberant spaces.

Grounded can be adjusted using the following parameters:



(1) **Diffusion**: Adjusts the texture of the reverb reflections. Turning the control to the right softens the early reflections.

(2) **Size**: Adjusts the swell and reflection pattern of the reverb effect, giving the impression of differently sized spaces. Turning the control to the right changes the size from small to large.



Riser Effect: By adjusting **Size** to 100%, enabling the Freeze function, and turning **Size** to the left, you can create riser effects. Set Density to Dense for a consistent wash of noise, or to Sparse for a more dispersed, granular sound. You can further shape the effect by adjusting the **High Cut** filter at the same time. For example, starting with **High Cut** at 1 KHz and turning the control to the right creates an increasingly bright sound.

(3) **Density**: Switches between two basic density modes for the reflection pattern of the reverb effect, Sparse and Dense. Sparse produces dispersed and clearly discernible reflections. Dense produces a more uniform reverb tail.



Metallic textures: By setting Density to Sparse mode and adjusting **Size** and **Modulation** to low values, you can use the reverb to add a metallic quality to the signal.



Granular textures: By setting the Density to Sparse mode and adjusting **Size** to high values, you can use the reverb to add a granular quality to the signal.

(4) **Decay**: Adjusts the length of the reverb, or reverb time. Turning the control to the right changes the reverb time from short to long.

(5) **Damp**: Adjusts the tonal quality from bright to dark. Turning the control to the right attenuates the reverb's high-frequency content.

(6) **Modulation**: Adjusts the amount of movement added to the reverb sound by changing internal parameters of the reverb over time. Turning the control to the right changes the movement of the reverb from lush to strongly detuned sounds.

10.2. Airy

Airy is based on the paradigm of a hall with naturally dispersed early reflections and a smooth reverb tail. The **Size** ranges from medium-sized chambers to large cathedrals and beyond. At the lower end of its range it overlaps with the **Grounded** algorithm, so it is possible to smoothly transition to the sound of smaller reverberant spaces.

Airy can be adjusted using the following parameters:



(1) **Diffusion**: Adjusts the texture of the reverb reflections. Turning the control to the right softens the early reflections and produces a smooth onset of the reverb.



Soft attack: By adjusting **Diffusion** to 100%, the early reflections disappear and the attack of the reverb is long and soft. You can use this to emphasize the body of melodic sounds.

(2) **Size**: Adjusts the swell and reflection pattern of the reverb effect, giving the impression of differently sized spaces. Turning the control to the right changes the size from small to large.



Riser effect: By adjusting **Size** to 100%, enabling the Freeze function, and turning **Size** to the left, you can create riser effects. Set Density to Dense for a consistent wash of noise, or to Sparse for a more dispersed, granular sound. You can further shape the effect by adjusting the **High Cut** filter at the same time. For example, starting with **High Cut** at 1 KHz and turning the control to the right creates an increasingly bright sound.

(3) **Density**: Switches between two basic density modes for the reflection pattern of the reverb effect, Sparse and Dense. Sparse produces dispersed and clearly discernible reflections. Dense produces a more uniform reverb tail.



Granular textures: By setting the Density to Sparse mode and adjusting **Size** to high values, you can use the reverb to add a granular quality to the signal.

(4) **Decay**: Adjusts the length of the reverb, or reverb time. Turning the control to the right changes the reverb time from short to long.

(5) **Damp**: Adjusts the tonal quality from bright to dark. Turning the control to the right attenuates the reverb's high-frequency content.

(6) **Modulation**: Adjusts the amount of movement added to the reverb sound by changing internal parameters of the reverb over time. Turning the control to the right changes the movement of the reverb from lush to strongly detuned sounds.

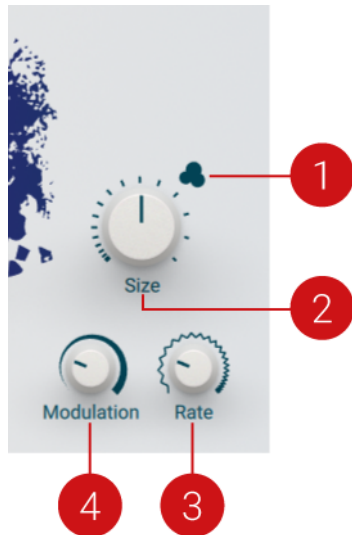
10.3. Cosmic

Cosmic not based on a classic reverb paradigm but extends RAUM's range of sounds to abstract spaces and ambient soundscapes. Since the algorithm is placed inside the **Predelay**'s feedback path, it interacts more closely with all of the parameters related to predelay (for more information about predelay, see [Predelay and Filters](#)).



Complex resonances: By combining **Cosmic** with low **Predelay** and high **Feedback** values, you can create sounds that range from metallic textures to deep, morphing resonances. For best results, set the Density to Sparse mode and adjust **Size** to high values.

Cosmic can be adjusted using the following parameters:



(1) **Density:** Switches between two basic density modes for the the reverb effect, Sparse and Dense. Sparse produces a dispersed, direct reverb sound. Dense produces a more washed-out, uniform reverb sound.



Granular textures: By setting the Density to Sparse mode and adjusting **Size** to high values, you can use the reverb to add a granular quality to the signal.

(2) **Size:** Adjusts the swell, shape, and decay of the reverb effect, giving the impression of differently sized spaces. Turning the control to the right changes the size from small to large.

(3) **Rate:** Adjusts the speed of movement added to the reverb sound using **Modulation** (4). Turning the control to the right changes the movement from slow to fast.

(4) **Modulation:** Adjusts the amount of movement added to the reverb sound by changing internal parameters of the reverb over time. Turning the control to the right changes the movement of the reverb from lush to strongly detuned sounds.

11. INTERVIEW ABOUT RAUM

Learn more about RAUM, its development, and reverb effects in general in this interview with Principal Software Engineer Dr. Julian Parker.

What was your role in the RAUM project?

I did development in terms of the reverb algorithm itself, and also in terms of tuning it, giving it an aesthetic perspective.

Can you elaborate on what the reverb algorithm is and how it relates to the final product?

The Grounded and Airy algorithms in RAUM are based on the idea of the feedback delay network, which consists of a lot of delay lines. They are all connected together by what is essentially a big mixer. In technical terms you would call it a matrix, a big grid of numbers that is describing the connection between all the delay lines.

The smoothness of a reverb is defined by how many resonances you can generate. A metallic sounding reverb does not have many resonances, just like a boxy room does not have many resonances. Whereas, a room that has a more irregular geometry sounds much more smooth. I noticed that the way people were using these feedback matrices was not optimal, because you would end up with resonances placed on top of each other at the same frequency. They just make that part louder instead of adding more density to the reverb. The Dense mode in Airy and Grounded was designed to give the most density possible. That was the initial spark for the project in technical terms.

The other thing I wanted to do when I initially designed the algorithms was to try and make the early reflections integral to the reverb network itself. The traditional way of dealing with early reflections was to have two things in parallel. You had the bit that generated your late reverb, which is diffuse. And then you had a completely separate, parallel structure that would do the early reflections, which is very flexible because you can design them specifically, separately. But then you have this really subjective task of balancing the early reflections and making them flow into the tail in a believable way. And that is quite difficult.

So in this case some of the challenging complexity of reverb is solved by a new take on how early reflections are generated.

Yeah, exactly. Instead of having a separate, parallel structure for the early reflections, you actually take the early reflections from inside the main reverb, in a very specific way. So you know, my first echo is going to come from this delay line, which has this length, and my second echo is going to come from that other delay line, which has that length. But they are present in the overall reverb anyway. This means that any time that is present in the reflections is also there in the build up of the late, diffuse tail. Which is of course what would happen in reality, because you have got sound bouncing around and build up until it turns into a wash. So, this is an attempt to unify those two things.

As far as I know, the basic technique of the feedback delay network goes back at least two decades or maybe three. Did any of the existing devices play a role in the development of RAUM?

Only in the broad sense. I mean, I wanted it to be able to do realistic reverb, but I also wanted it to fulfill the role of certain Lexicon reverbs or the Alesis Quadraverb, for example. I wanted it to be able to be an unreal reverb that sounded good. But we did not want to go back to the same algorithms. We wanted a more modern, more hi-fi take on those sounds. By the way, Cosmic is not using a feedback delay network, it is more in the direction of the traditional Lexicon and Alesis reverbs, or the Eventide ones.

Many effects provide flexibility through lots of modes and controls, RAUM is very focused. Only three algorithms, and fewer controls compared to many other reverbs. What was the thought process behind selecting the controls and their ranges to cover all this ground?

What we aimed for was to make sure that every parameter is interesting, and also to try and give them wide ranges, but wide ranges that were sensible. Wide ranges where all the settings are interesting, but different. I think this is especially true for the size control, which has a super wide range. It goes from really tight to so sparse that it is almost like a granular effect. But there is never a point where you would think: "Why would I turn it here, this is not usable." It is a nice gradient of useful things.

We tried to do this with all of the controls, I would say. The modulation is another good example. In the early parts of the control you just get a little bit of movement that breaks up echoes, more like the traditional reverb modulation use case. As you go up to 30, 50 percent you will get chorusing. Once you go above about 70 percent, it will start going into weird, uncanny territory, where it sounds detuned and dissonant. You have got three different use cases, and then you try and pack them all into the same control, and make the transition between them meaningful.

Reverb is often understood as a set and forget effect, but RAUM feels really playable and sounds great when automated. You can throw automation at pretty much any control and it still sounds good. Was this intentional?

Yeah, it is definitely intentional. We first started thinking about reverb like this in the context of MASHINE, where you want every effect to sound great when using it with the automation view. But I guess it was also just the Zeitgeist. For example, Tom Erbe did the Erbe-Verb, which is heavily invested in real time control issues for reverb. I thought more about this again when we started working on RAUM.

I would say we did focus on this especially with the pre-delay section, and also with the Freeze function. I mean, Freeze does not even make much sense in a set and forget way, you either automate it or play it live. It is an interactive performance element. The filters are also very carefully tuned to feel nice. Both for tweaking the tone of the reverb, but also for playing with them.

I think we were just very aware that it is interesting to allow a reverb to do these things. In a way, it takes it from being a mixing or texture effect to being an instrument. Also, if you are designing parameters to be nicely automated, they just feel better when you are turning the controls. So even in normal usage it contributes to the user experience.

Do theory or tweaking play a bigger role in developing a reverb?

I think tweaking is super important, but not in the way of throwing stuff against the wall to see what sticks. What I like to do, and I do this not just with reverbs, is to understand how the tweaks are going to change the sound. Then I can be listening to the correct things and tweak until they sound how I want them to be. It is about having a clear idea of cause and effect. With reverbs that sometimes gets difficult as it is such an abstract system, there are so many different things interacting. I try to maintain a strong connection between what I am trying to achieve and how I would have to listen to actually hear it.

Neither is really more important than the other. The algorithm sets the bounds of what you can do, but it is going to have a lot of bad sounds in that space. So tuning and giving it meaningful parameters is what makes it sound good, I would say. If the algorithm is not very capable, you still might be able to make it sound great for one specific situation, but it is not going to have a wider applicability.

Tell me one of your favorite uses of RAUM.

I definitely like using the pre-delay section as a resonator or a comb filter.

Then let us talk about pre-delay.

Every reverb has pre-delay, but it is usually just a utility function, unless you can maybe sync it. We wanted to have it syncable, so we put that in, and then I thought, hang on. We just have this delay line here and it is not really doing anything apart from delaying the input. All we have to do is add one feedback path and then suddenly we have got something quite interesting. So that is how we ended up having the feedback control.

But there is a lot of other things going on in there. The sound of the pre-delay is very specific. It is a bit like the Modern mode in REPLIKA, but not exactly. Most of the time when you are doing delays, you use interpolation to exactly hit a particular delay time. But the problem is that any time you use interpolation, it introduces filtering. Especially if you have feedback, you can hear that in a degradation of the signal as it recirculates.

In this case we basically decided that we do not care if there is a tiny fraction of a millisecond of error in the delay time. We are going to quantize all the available delay values to an integer number of samples, which means we do not have any loss from interpolation. So you have an absolutely lossless delay line, until you start introducing filtering yourself. And I think you can really tell the difference here, especially in the comb filtering use cases, because it has this high frequency clarity which is a bit unusual.

We also did not want to use distortion to tame the peaks when you are doing comb filtering, because this would also make it less clean than we wanted it to be. But it is still necessary, because if you have a completely linear comb filter, you will get really strong resonances that are super loud. So instead, we put a limiter in the feedback path. Not in the main signal path, but when the delay is recirculated, then it goes through a limiter. The release time of the limiter is adapted based on the delay time, so it never really sounds like limiting. It just means that it stops the feedback from getting out of hand, while still allowing it to resonate nicely. I think you can really hear that. I never really got that kind of cool sounds out of high frequency comb filtering before.

What are some of the other use cases where this clean pre-delay sound comes into play?

I mean, obviously it is just better even as a normal pre-delay, because you do not have any high frequency filtering if you do not want it. It is also nice when you use it as a looper. You can use extremely long delay times, I think four bars is the maximum. This interacts really nicely with the limiter as well, because then the limiter kind of acts like an auto overdub feature.

The sound is completely clean and will recirculate forever at 100% feedback, and then you can play on top and introduce bits into the buffer. If you had interpolation, that would not work because after 20 repeats or something you would start to hear the filtering building up and building up. But this will hold a loop forever, unless you dial in the filters.

You mentioned earlier that Cosmic is a different algorithm.

Cosmic is completely different. It is basically a new flavor of the REPLIKA Diffusion mode. We changed the modulation, its range is much wider in RAUM. Also in REPLIKA you have one control for both the amount of modulation and the frequency, which is nice but also a bit restrictive. We wanted to give it much more control. You have pretty huge modulation depths available and also a wide frequency range all the way up to low audio rates. It gets fast enough to produce noisy sounds. This was done to give it a wider variety of tones.

And the pre-delay feedback includes it in some way, right?

Yeah, the thing about Cosmic is that it is just a lot of cascaded all-pass filters. It needs to sit within a delay loop with feedback in order to make longer reverbs. Grounded and Airy are sitting after the pre-delay, and the feedback does not include them. But in Cosmic the reverb part is put inside the feedback loop.

The nice thing about Cosmic is that each time you get an echo with the pre-delay it gets more blurred and more diffuse. Which is great sometimes, but then Grounded and Airy are nice because you can add space on top of whatever you are doing with the delay, without it all getting smeared out and completely mushed. The two approaches have different kinds of strengths and use cases. That is why we wanted to have them both.