3D Physics Synthesizer

USER GUIDE

BETA VERSION

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1. Overview

Welcome to Anukari

Thank you for purchasing Anukari, a groundbreaking new 3D physics synthesizer for macOS and Windows. Anukari allows you to build and interact with virtual instruments and effects in real-time 3D space, using intuitive tools and drag-and-drop objects to create radically new sounds.

Features

Interactive Real-world Physics
Anukari's unique physics playground utilizes Newtonian mechanics to accurately simulate how objects react to forces such as spring tension and mallet strikes.

Anukari lets you build your own 3D instruments made up of physics-controlled masses and springs, which can then be "played" using virtual exciters, mouse gestures, keyboard commands, external audio devices, or even your own voice. You can keep it simple, or architect sprawling systems of hundreds of interactive masses. And because you can precisely control and modify every object, each virtual instrument is totally customizable.

Versatile MIDI & MPE Support
Anukari works with both "legacy" MIDI and MIDI Polyphonic Expression (MPE), so you can use a regular MIDI keyboard or an MPE controller such as a Linnstrument, Roli Seaboard, or Haken Continuum.

Use your MIDI controller to trigger virtual mallets, plectrums, oscillators, bows, and LFOs to play your 3D instrument. You can also map a MIDI device to modulate playback parameters in real time.

Creative Effects Processing
Anukari can accept audio input signals as a sidechain input alongside MIDI, or as the primary input. Anukari lets you visualize audio inputs as 3D objects, connect those objects to your physics-based virtual instrument, play that instrument, and then pick up the resulting sounds with virtual microphones. Throw in a few dozen delay lines for reverb or feedback effects. Or, why not use LFOs to modulate the spring stiffness? Whatever you can dream up, you can build.

Limitless Modulation
In addition to basic physics objects, Anukari offers many options for modulation: sample-accurate LFOs capable of FM audio frequencies, MIDI-triggered envelopes, envelope followers, MIDI control sources, DAW automation parameters, and more. The modulation matrix is simple to understand: it's displayed via physical connections in Anukari's 3D world, and nearly every parameter can be modulated.

Powerful GPU Processing
Anukari processes audio on your graphics card (GPU), giving you massive computing power at your fingertips while leaving CPU power available for other plugins. Curious to hear what 500 detuned oscillators on a single voice sounds like? Go ahead. Need dozens of LFOs for some crazy experimental glitch instrument? No problem. Want to create hundreds of plectrums for the fun of it? Why not!

Plugin and Standalone Options
You can run Anukari as a VST3, AU, or AAX plugin in your favorite DAW on macOS or Windows. Or, run Anukari in standalone mode to play it as a MIDI instrument without the complexity of a DAW. Anukari only uses a fraction of your GPU's resources, so you can run multiple instances of the plugin in your DAW, using it as both a synthesizer and an effects processor, for example.

Real-Time, Customizable 3D Interface
Anukari isn't just another stylized faceplate covered in knobs. *You* create the instrument's physics layout in an intuitive 3D editor (kind of like a video game), and then see how it vibrates, flexes, spins, and moves in real time as you play it. Drag and release a mass with the mouse to discover what happens! Or, project fully customizable 3D visuals during a show so the audience can see and hear the 3D instrument in action using Cinematic Mode.

Anukari ships with a wide variety of built-in skyboxes, 3D models, skins, and visual effect options, so you can fine-tune the look that's right for you. Anukari also supports importing custom skyboxes and 3D models. Using 3D modeling software like Blender, advanced users can completely transform the 3D visuals and animations.

Anukari User Guide

This user guide provides a detailed explanation of Anukari's operational features and how to use them. We recommend that you take the time to read through the user guide thoroughly, whether you're new to software synthesizers or a more experienced user, as Anukari has many unique functions and use cases.

If this main user guide does not provide all the information you need, please visit the Support section of anukari.com. Our website support offers comprehensive video tutorials, FAQs, and much more. (See also Help and Resources in this user guide for additional information.)

We also encourage you to visit anukari.com for the most up-to-date information on GPU and system requirements, and to download the free demo of Anukari before purchase.

2. Installation & Licensing

To install Anukari, download the installation file from the following address:

https://anukari.com/download

Select your operating system (Windows or macOS) and then click the button labeled "Download." From here, your web browser will download and save the installation file to its download folder. For Windows, this will be a .exe file. For Mac, it will be a .pkg file.

When the download is complete, open the download folder and run the installation file. Follow the onscreen instructions. Once the installation has finished, you can run Anukari.

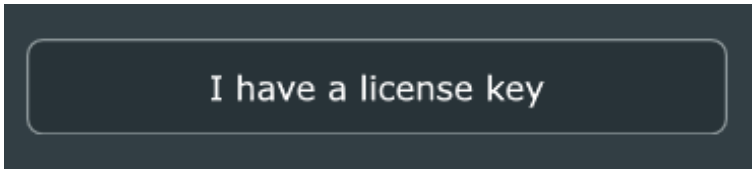
The first time you launch Anukari, it will walk you through the initial setup. You will be prompted to choose between entering a license key to use the full paid version of the software or continuing without a license key to use the free demo.

The free demo has all of the features of Anukari, but it will periodically play a whoosh of white noise to render the output unusable for recording. If you try the free demo and would then like to purchase a license for the full version, visit:

https://anukari.com/buy-now

Click the "Buy Now" button to initiate the purchase. Once you have completed payment for the full license, you will receive an email with your 24-character license key (e.g., `123ABC-123ABC-123ABC-123ABC`).

Once you have the license key, and if you are launching Anukari for the first time, click the "I have a license key" button at the first prompt:



If you have already launched Anukari in free demo mode, click the "Enter License Key" button in the upper-right portion of the main Anukari window:

In each case, follow the prompts to input your license key and activate the full software.

Multiple Installations

An Anukari license key entitles you to have Anukari installed on three (3) personal devices at a time. For example, you could have Anukari installed on your Windows desktop, your Windows laptop, and your macOS laptop.

If you have reached the limit of installing Anukari on three personal devices and attempt to enter your license key on an additional device, the key will not activate the full version of the software.

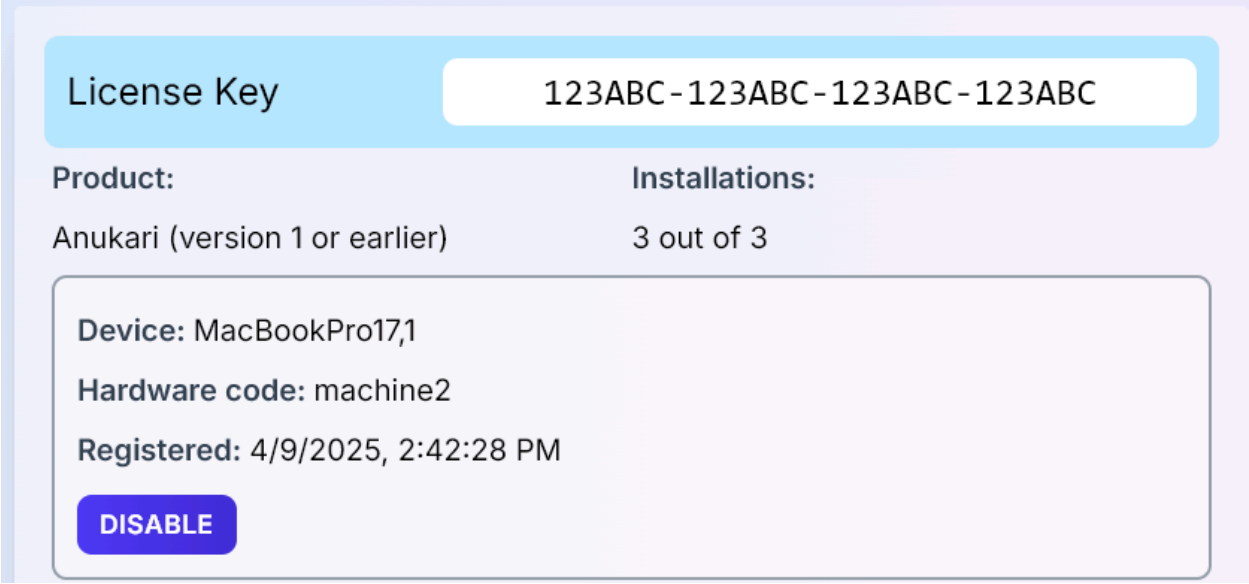
To install Anukari on a different device, it will be necessary to deactivate the software on one of the existing devices.

Deactivating Anukari on an Existing Device

To activate Anukari on a different additional device, you can deactivate it from one of your original three devices by visiting:

https://anukari.com/account

Here, you will see a panel showing your license key, the number of devices it is installed on, and information about each of those devices. Find the device on which you wish to deactivate Anukari, and click the “DISABLE” button.



Once you have disabled an existing device, Anukari will revert to free demo mode on that device. You can then enter your license key on a different device to activate the paid version there.

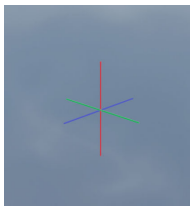
Note that this operation is reversible and repeatable: You can deactivate (or reactivate) your Anukari license on any device at any time, up to three devices.

⚠ **IMPORTANT NOTE:** Though you are not required to enter your license key on the website to access the full version of Anukari, it is STRONGLY RECOMMENDED that you do so. This will permanently link the product key to your email address and ensure that you have full control over which devices it is activated on.

3. Main Window & Navigation

This is the main application window for Anukari. It displays all the objects and parameters from a preset alongside tools for editing and navigation. The main window is where most preset design work is done.

1. **3D Space**: This is the main area where objects are placed and connected.

   3D Space also contains this marker (pictured left) which denotes the center of the camera view. To center the camera's view on any object, simply double-click it.

2. **Object Mode Toggle**: This button controls whether clicking and dragging an object will move the object to a different space or will rotate the object's orientation.

3. **Grid Mode Toggle**: This button will activate snap-to-grid mode for object placement. Snap-to-grid has three levels of detail that affect the grid display. Click the button to cycle through the grid levels and/or deactivate snap-to-grid mode.

4. **Camera Mode Toggle**: This button will toggle through different views of 3D space. These include an isometric view, front view, top-down, and side-view.

5. **Camera Zoom**: Click and hold this button, then drag the mouse to zoom in and out inside 3D space. You may also use the mouse wheel for this same function.

6. **Camera Pan**: Click and hold this button, then drag the mouse to pan the camera view inside 3D space. You may also hold SHIFT and click-and-drag the right mouse button for this same function.

7. **Camera Rotate**: Click and hold this button, then drag the mouse to rotate the camera view around inside 3D space. You may also click-and-drag with the right mouse button for this same function.

8. **Simulation Pause/Play Toggle**: Click this button to pause/play the simulation engine that controls the physics for object interaction inside 3D space. When the simulation is paused, no physics modeling occurs; therefore, objects do not react to energy. When the simulation is unpaused, it will begin modeling the conditions for objects to react to energy and generate sound.

9. **Rest Reset**: The “Rest Reset” button returns all objects of the current preset to their default resting state, where no energy is present in the system of objects.

10. **Rest Replace**: The “Rest Replace” button takes a “snapshot” of the current state of the system and sets this as the new default rest state. From here on, whenever the “Rest Reset” button is pressed, it will return the system of objects to this new default state.

11. **Object Palette**: This contains all of the objects that can be used in an Anukari preset. Clicking an object and dragging it into the 3D space area will add that object to the current preset.

12. **Tuner**: This is the tuner for Anukari. It registers pitch for any audio that plays from the app. It is used for tuning preset objects and/or systems to specific notes.

13. **Object Properties**: This area displays parameters and options for objects when they are selected in 3D space. For more info on object parameters, see the section on Objects & Properties.

14. **Preset Properties**: This area displays parameters that apply to the entire preset.

15. **GPU Meter**: This meter displays the current workload that Anukari is placing on your computer's graphics processor. High GPU levels may cause issues like static noise or unresponsive presets.

16. **Audio Output Meter**: This meter displays the audio levels that are currently being output from Anukari. In simple terms, it is a volume meter.

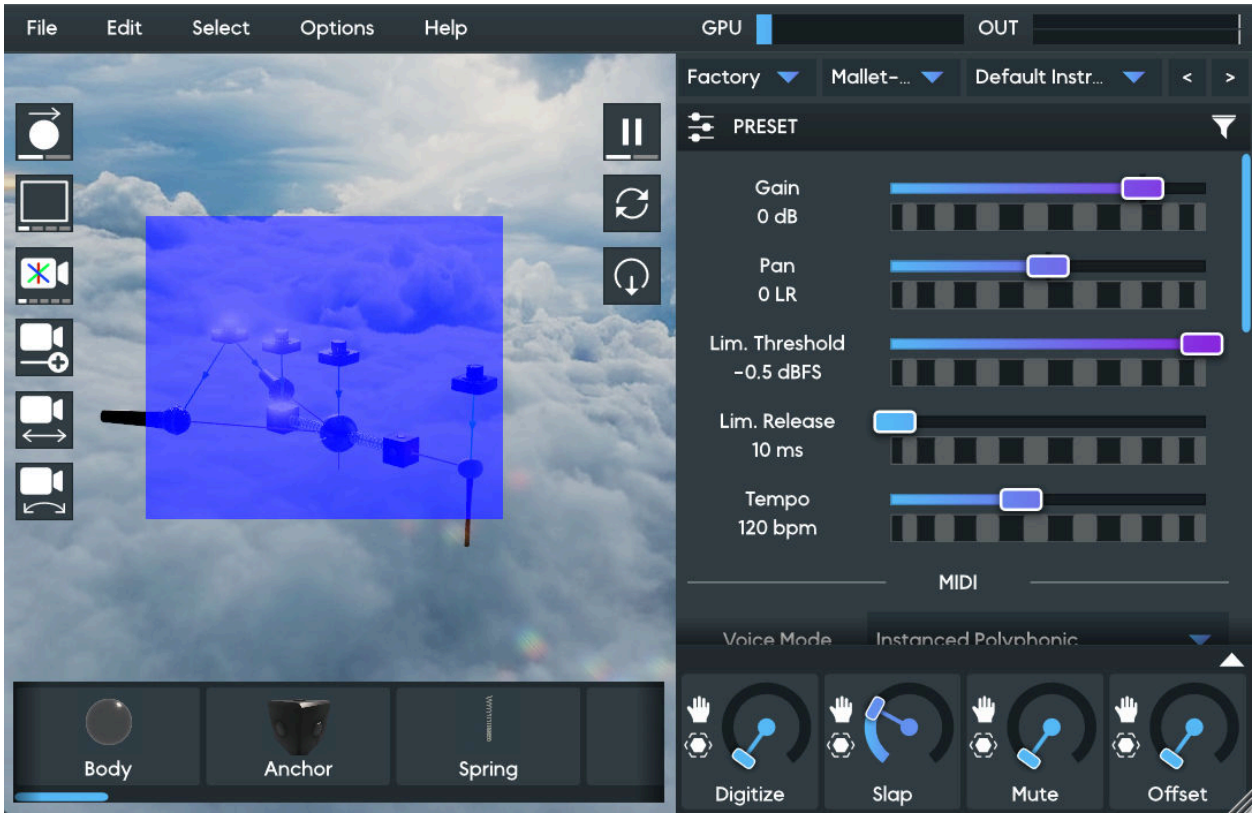
17. **Preset Selector**: This is the control by which presets can quickly be loaded and switched. There are drop-down menus to select different collections (factory, user, etc.), categories, and preset files to load. The "<" and ">" buttons (previous and next) will instantly cycle through the preset files within the selected category.

18. **Macro Panel**: This panel shows knobs to control up to eight macros**.** By default, it only shows four macros, but it can be expanded/collapsed to show the other four macros by clicking the small white triangle in its upper right corner.

4. User Interface Tips & Tricks

Selecting Objects in the 3D View

Most preset editing in Anukari begins with selecting the physics objects that you wish to edit in the 3D view. This can be done by clicking on an individual object or by using the left mouse button to drag a box and select multiple objects:



☑ ***TIP**: Note that the various kinds of connectors between objects (Springs, Modulator Links, etc.) are objects themselves and can be selected. Many, but not all, connectors have editable parameters.*

The panel on the right side of Anukari's display will automatically show the parameters that can be edited for the objects that are currently selected. Parameters are grouped by each type of entity that is selected. For example, in the screenshot below, the selection consists of two Anchor objects and one Body object, and the parameters for each type of object are shown in panels "1" and "2".

The Object Editor panels can be resized by dragging their headers up and down with the mouse. Double-clicking a header will maximize its size. Finally, clicking the Filter button (labeled "3" in the diagram) will filter the selection to only the given type of object.

☑ ***TIP**: It's often useful to use the Select All hotkey (Ctrl + A on Windows, ⌘ + A on Mac), and then to click the Filter button next to the entity type you wish to work on.*

☑ ***TIP**: Double-clicking an object in the 3D view will center the camera on that object.*

Adding to and Removing from the Selection

You can add or remove objects from the current selection by holding down specific keys while clicking an object or dragging a box:

1. **Hold Shift + click object**: Add a single object to the selection.
2. **Hold Shift + drag a box**: Add multiple objects to the selection.
3. **Hold Ctrl (Windows) or ⌘ (Mac) + click object**: Remove a single object from the selection.
4. **Hold Ctrl (Windows) or ⌘ (Mac) + drag a box**: Remove multiple objects from the selection.

☑ ***TIP****: Each of these operations can be repeated as many times as you like. For example, you can add several objects to the selection by holding Shift and clicking a few objects one after the other. If you change your mind, hold Ctrl (Windows) or Control (Mac) and click on the objects you just added to remove them.*

Connecting Objects

In Anukari, objects can only interact if they are connected with a link. There are several kinds of links, including:

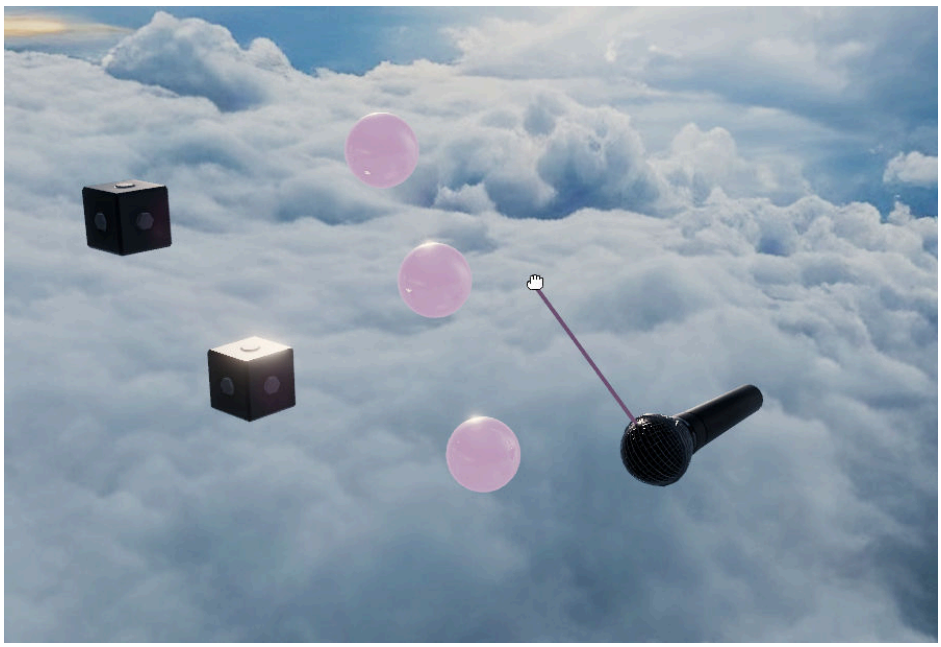
- Springs
- Exciter Links
- Mic Links
- Delay Lines
- Modulator Links

⚠ IMPORTANT: Objects can only interact if they are connected with a link!

In the real world, simply pointing a mic at an object will allow it to pick up sound from that object. But in Anukari, Mic objects must be linked to the objects you wish to pick up. Exciter objects are similar; e.g., a Mallet must be connected to a Body in order to strike it.

The easiest way to link two objects together is to hover the mouse over an object and press the “C” hotkey (“C” stands for “Connect”). This will highlight all the objects that the first object can be connected to. Then, click the mouse on one of the highlighted objects to connect them.

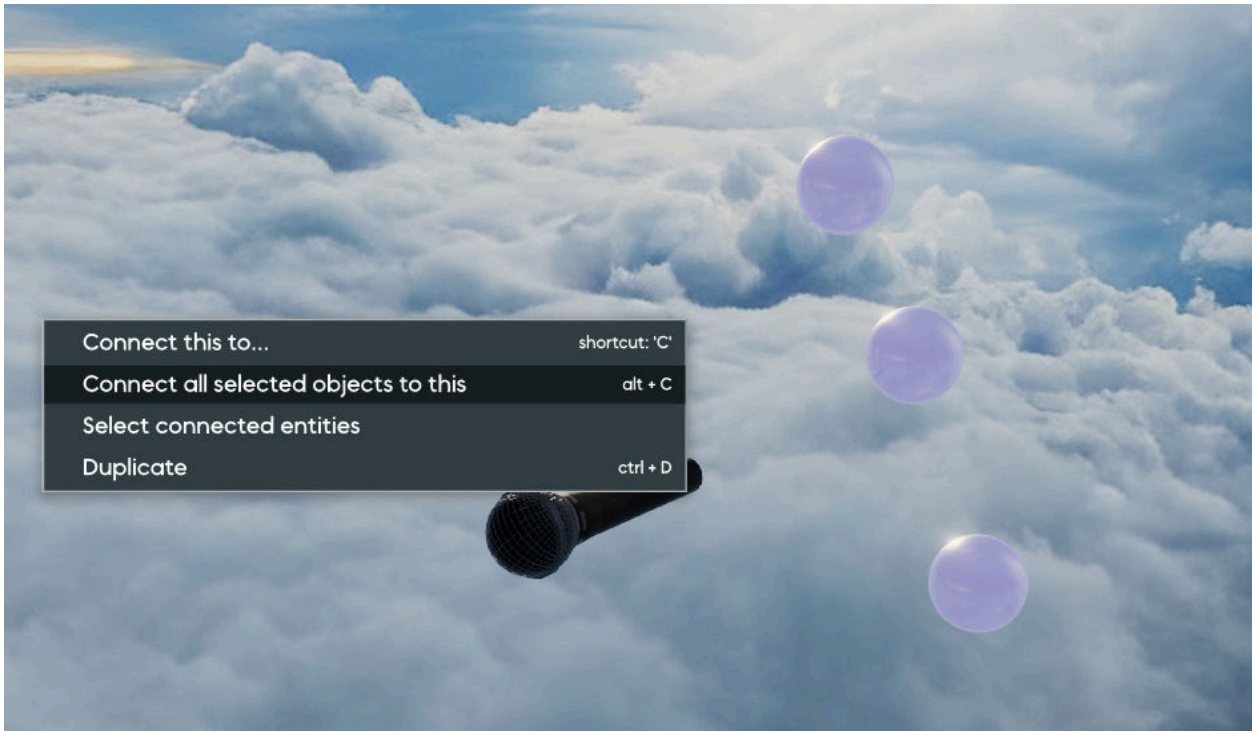
In the diagram below, the “C” hotkey was pressed with the mouse over the Mic object. The three Body objects are highlighted, but the two Anchor objects are not, which tells you that the Mic can be connected to a Body but not an Anchor. Clicking on a Body will connect it to the Mic.



Connecting Multiple Objects

You can also connect an object to multiple other objects. For example, since Mic objects only pick up sound from connected Body objects, you may wish to connect a Mic to several Body objects to pick up sound from all of them.

Option 1: Select all the objects that you wish to connect to another object, then right-click on that target object. Next, select the *"Connect all selected objects to this"* menu option, as shown in the diagram below.



Option 2: Select multiple objects, then drag another object from the Entity Bar (at the bottom of the screen) onto the Object Editor panel header for the previously selected objects.

For example, as shown in the diagram below, multiple Body objects are selected, and a Mic object is being dragged from the Entity Bar. The header for the "BODY" Object Editor panel on the right side is highlighted, indicating that dropping the Mic on this header will create a Mic object that is connected to all the selected Body objects.

☑ ***TIP***: *For some objects, using the "C" hotkey to connect them will create a different type of link depending on which direction you make the connection.*

For example, connecting from an Envelope Follower to a Mic will create a Modulator Link. Whereas, connecting in the opposite direction from a Mic to an Envelope Follower will create a Delay Line.

In general, the link type is related to the direction in which a signal will follow. Audio signals go from Mics to Envelope Followers, and Modulation signals go the opposite way.

Copy, Paste, and Duplicate

Anukari supports Copy, Paste, and Duplicate operations that you are likely already familiar with. These options are available under the Edit menu, when right-clicking a selected object, or via the following hotkeys:

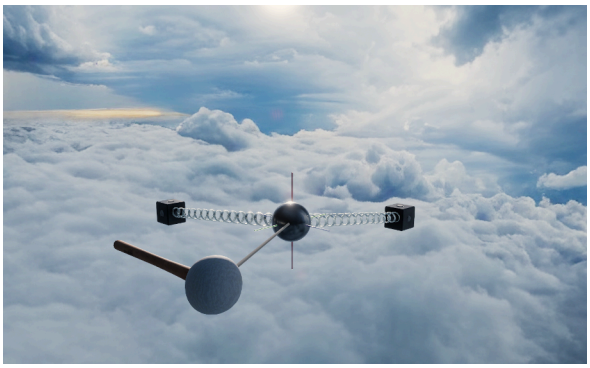
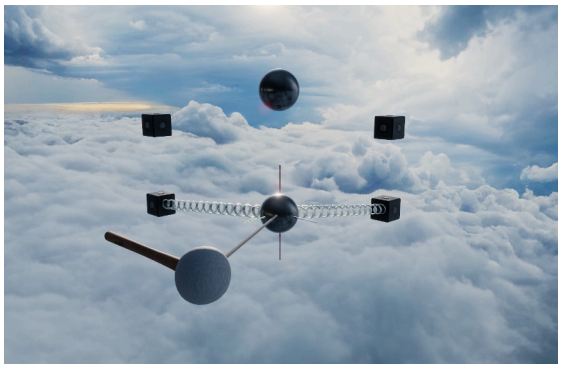
1. **Copy**: Ctrl + C (Windows), ⌘ + C (Mac)

2. **Paste**: Ctrl + V (Windows), ⌘ + V (Mac)

3. **Duplicate**: Ctrl + D (Windows), ⌘ + D (Mac)

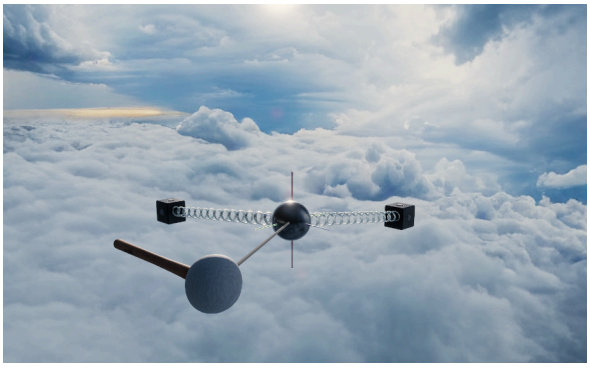
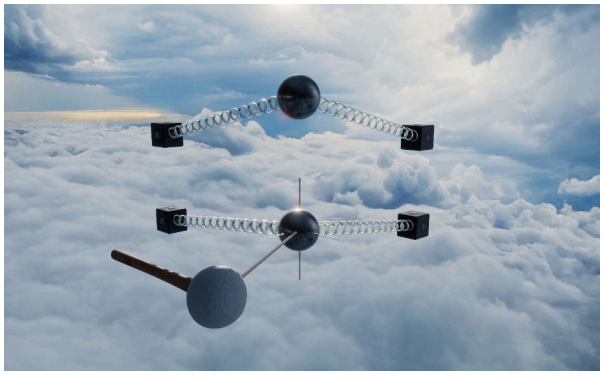
⚠ Specific to Anukari's copy and paste system is one important function: how links between objects are copied. Here's how it works:

In the sample preset below, a Body is connected by Springs to two Anchors, and a Mallet is connected to the Body. If you select only the Body and two Anchors and then press the Duplicate hotkey, this will be the result:

Original Preset	*After Duplication*
	

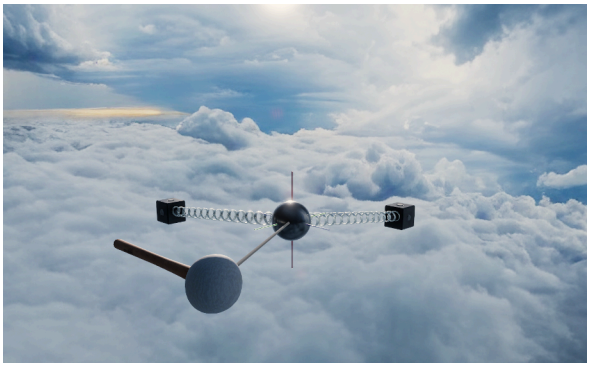
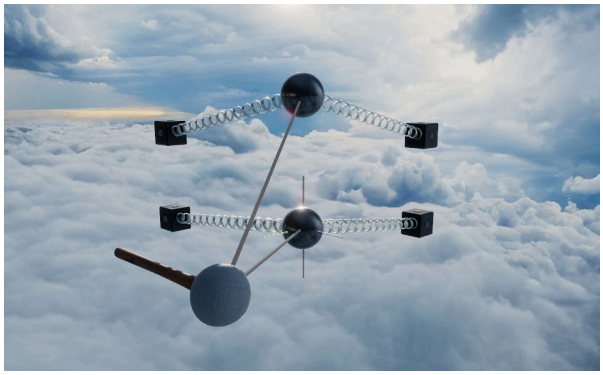
Notice that the Spring objects are not copied, because they were not part of the original selection.

Now let's look at what happens if you select the Body, the Anchors, and the Springs, and then press the Duplicate hotkey:

Original Preset	*After Duplication*
	

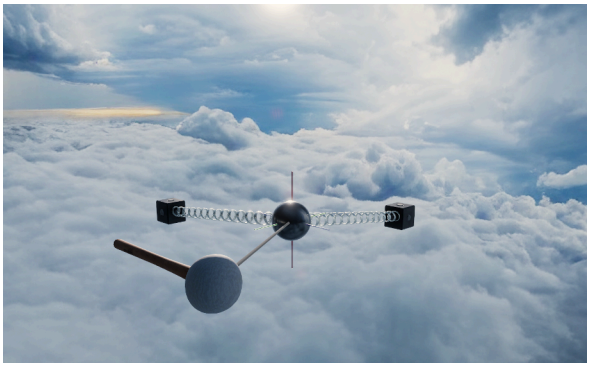
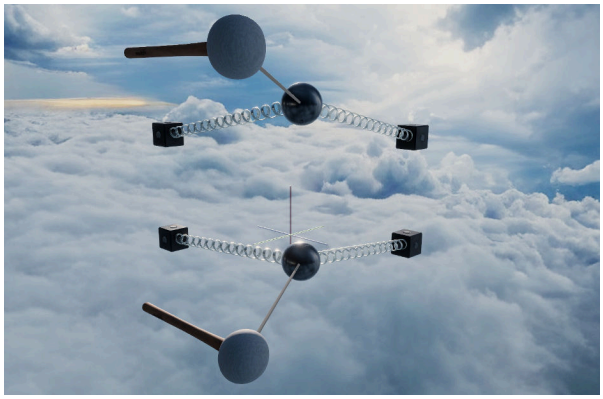
Notice that this time, because the Spring objects were selected, they *are* copied.

Now let's look at what happens if we select everything *except* the Mallet object. The Body, Anchors, Springs, and even the Exciter Link are selected, and then Duplicated:

Original Preset	*After Duplication*
	

Notice how **the duplicated system is connected to the original unduplicated Mallet object**. This function is useful when you wish to duplicate some objects, but not others, while ensuring that the duplicate objects remain connected to the objects that were not duplicated.

Finally, to duplicate the entire system, you can select everything (including the Mallet) and Duplicate:

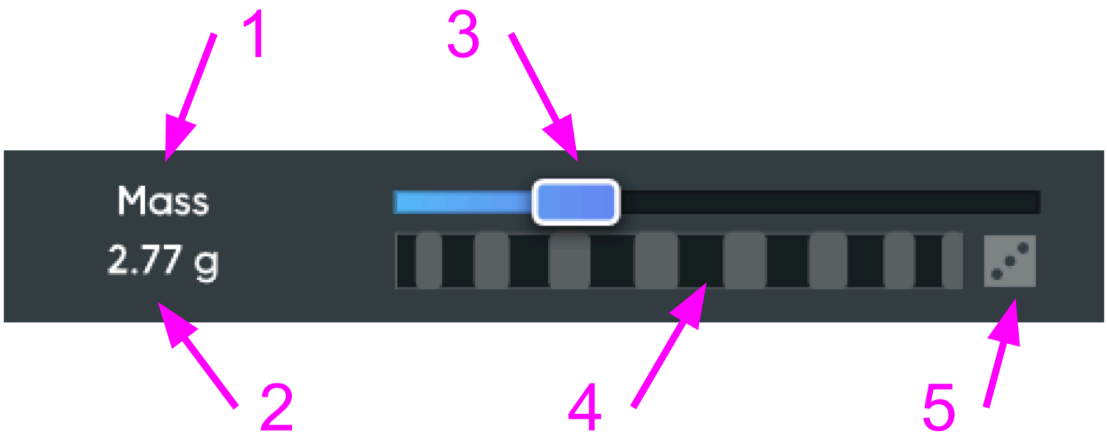
Original Preset	*After Duplication*
	

Notice how this results in a full duplicate copy of all objects.

By making careful choices about which objects are selected when using Copy, Paste, or Duplicate, you can determine how the resulting system or objects are connected to existing objects.

Parameter Sliders

The main tool for editing numeric parameters in Anukari is the Parameter Slider. These sliders appear in the right-hand Object Parameter Editor panel, based on what kinds of objects are selected in the 3D view. When the slider is moved, it changes the parameter value for *all* of the objects selected in the 3D view.



1. **Parameter name**: The name of the parameter that this slider controls; in this case, mass. Hovering the mouse over the name will show a detailed tooltip explaining what this parameter does.

2. **Parameter value and units**: The value of the parameter and units; in this case, 2.77 grams. Click on this to open a text editor where you can type in a precise value.

3. **Coarse adjustment**: Drag this slider or click along its track to make larger adjustments to the parameter value. You can also hover the mouse over this and use the scroll wheel. Right-click the slider handle to “split” a single-value slider into a Range-Value Slider. For sliders that have a default value, double-clicking this will reset the value to the default.

4. **Fine adjustment**: Drag this thumbwheel to make smaller adjustments to fine-tune the parameter value. This is especially useful when tuning the pitch of an instrument or making other changes where the sound is very sensitive to the precise value. You can also hover the mouse over this and use the scroll wheel.

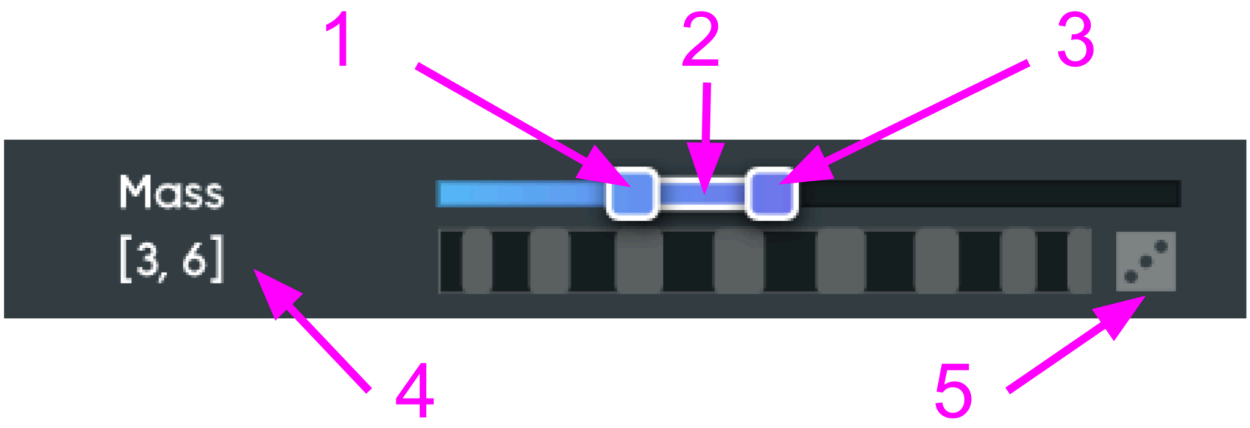
5. **Randomize button**: Click this button to assign a random value for the parameter.

Range-Value Sliders

Parameter Sliders control the value for *all* objects selected in the 3D view. But each object has its own unique parameters, which means that if multiple objects are selected, they may have varying parameter values.

In this situation, the Parameter Slider will appear as a Range-Value Slider, which allows the parameter values to be edited in bulk by stretching, compressing, or shifting the value range.

For example, if five Body objects are selected, and their masses are 1, 2, 3, 4, and 5, respectively, then the Range-Value Slider will show a range of 1 to 5. If the top of the range is stretched to 10, then their masses would become 1, 4, 6, 8, and 10, respectively. Notice how their values are stretched proportionally over the range.



1. **Low value handle**: Indicates the lowest value of this parameter over all selected objects. Drag this to stretch or compress the range of parameter values for all selected objects.

2. **All values handle**: Drag this to shift the parameter values for all selected objects up and down without stretching or compressing the range.

3. **High value handle**: Indicates the highest value of this parameter over all selected objects. Drag this to stretch or compress the range of parameter values for all selected objects.

4. **Parameter value range**: The numeric range of parameter values. Click on this to open a text editor where you can type in a precise range in the following format: *[lowest, highest]*. The square brackets are important; if you type a single number without brackets, then the parameter on all objects will be set to the same value.

5. **Randomize button**: Click this to randomize the parameter values for all selected objects *within the current range*. Clicking multiple times will continue to use the original range for randomization.

Using Macros

Anukari supports drag-and-drop Macros, which allow you to quickly set up on-screen knobs to control parameter values. There are a total of eight Macros available.

When running Anukari as a plugin in a DAW, these Macros will be visible in the DAW as parameters that can be automated, recorded, etc.

When running Anukari as a standalone app, these Macros are automatically mapped to MIDI Continuous Control numbers 1-8. On most MIDI controllers, these will correspond to the Mod wheel (#1) as well as the physical knobs and sliders on the controller. Note that some controllers may use different Control numbers than 1-8, and the controller may need to be configured to use 1-8 for compatibility with Anukari.

1. **Drag and Drop Handle**: Click and drag from this handle onto the 3D view to create an unconnected Macro object. Or, drag it onto a modulatable parameter in the Object Editor panel on the right side to connect it to that parameter on the selected objects (see the Macro Drag and Drop section for a detailed explanation).

2. **Select Button**: Click here to select all of the Macro objects in the 3D view that are controlled by this knob. Many Macro objects can be controlled by one knob.

3. **Macro Name**: Click here to edit the Macro name. When running Anukari as a plugin, this name will appear in your DAW so that you know which parameter is which. This name is saved as part of the current preset.

4. **Macro Knob**: Click and drag here to change the Macro value. When running Anukari as a plugin, adjustments made to this knob will be visible in your DAW and can be recorded. Right-clicking the knob will open up the DAW automation menu (for DAWs that support this).

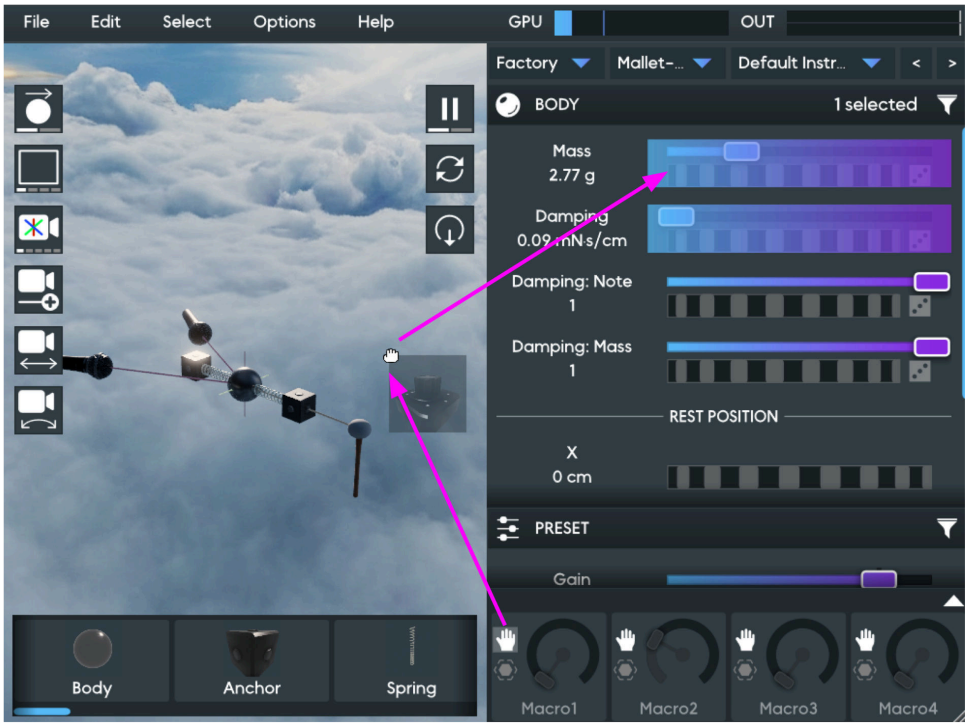
5. **Expand/Contract Panel Button**: Click here to expand the Macro panel to show all eight Macros; click again to go back to showing just four Macros.

Macro Drag and Drop

Like all other objects in Anukari, Macro objects must be connected to other objects in order to work. Connecting Macro objects can be done in the 3D view by creating a connection with the “C” hotkey (or other means), and then by selecting the Modulator Link and editing its Target parameter. However, there is a much faster way to create Macros, which is the drag-and-drop system.

To use the drag-and-drop system, first select the objects that you wish to modulate in the 3D view. For example, if you wish to modulate the Mass on several Body objects, you would start by selecting the desired Body objects.

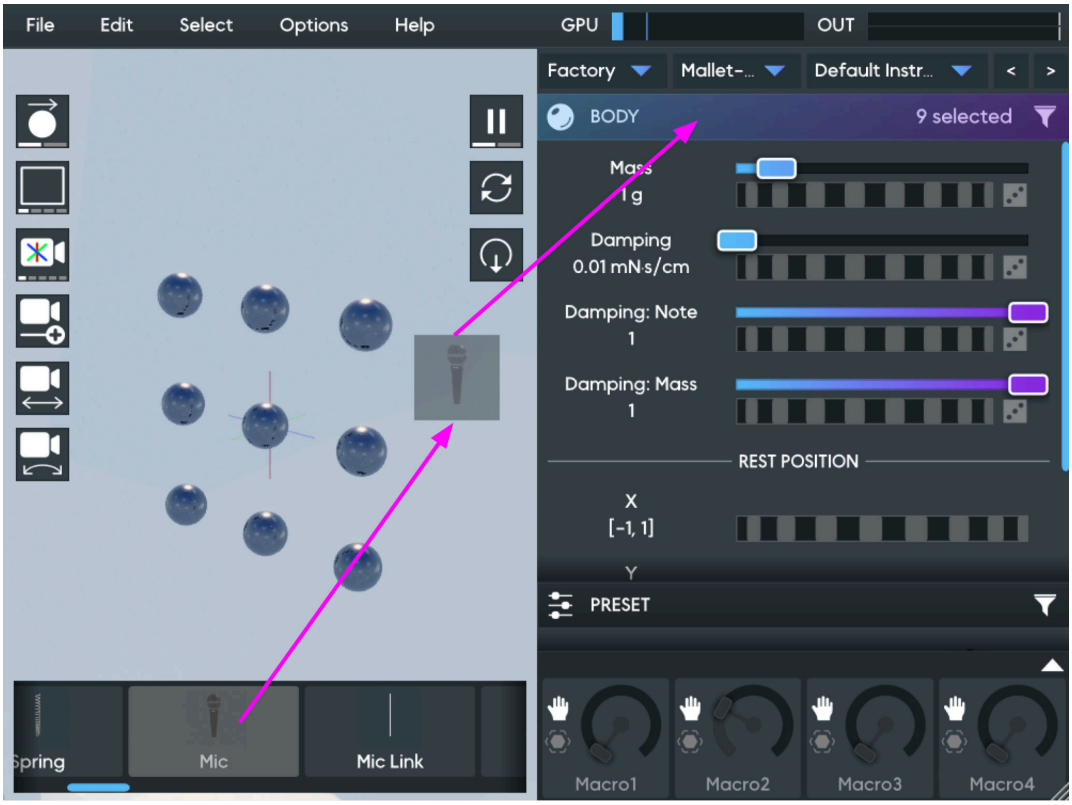
The next step is to drag the mouse from the desired Macro’s handle (i.e., the little hand icon next to the knob). While dragging the mouse, the parameters that can be modulated on the selected objects will be highlighted in the Object Editor panel on the right-hand side. Dragging the mouse to one of the highlighted parameters and then dropping the Macro on it will automatically create a Macro object in the 3D view connected to the given parameter on the selected objects.



☑ ***TIP***: *The drag-and-drop system also works when dragging other kinds of modulators from the Object Palette. For example, you can drag an LFO from the Object Palette onto the Mass parameter in the same way that you can drag a Macro from its grab handle.*

Other Drag and Drop

Some non-Modulator objects can also be connected to other objects via the same drag-and-drop system. This feature can be used to conveniently connect a new object to many target objects. To use this feature, select the desired target objects in the 3D view, and then drag a new object from the Object Palette onto the heading in the right-hand Object Editor panel for the target objects, as shown in this diagram:



The following kinds of connections can be made using this drag-and-drop feature:

Drag new Mic onto Body heading: This will connect the Mic to the selected Bodies with Mic Links.

Drag new Mic onto Envelope Follower heading: This will connect the Mic to the selected Envelope Followers with Delay Lines.

Drag new Exciter (Mallet, Audio Input, Oscillator, Bow, Plectrum) onto Body heading: This will connect the Exciter to the selected Bodies with Exciter Links.

Drag new Audio Input onto Mic heading: This will connect the Audio Input Exciter to the selected Mics with Delay Line links.

Cinematic Mode and Screen Capture

Cinematic Mode temporarily hides all of Anukari's 2D controls and menus so that the 3D view can be expanded to fill the entire window. This is useful for scenarios such as projecting Anukari's 3D visuals to your audience during a performance, or using screen capture software to record the 3D visuals for sharing on social media.

Cinematic Mode can be enabled via the Options > "Cinematic Mode" menu option, or via the hotkey F11 (Windows) or ^ + ⌘ + F (Mac).

To exit Cinematic Mode and restore the 2D controls, press one of the hotkeys described above, or move the mouse cursor to the top center of the window, which will bring up a button that you can then click to exit.

☑ ***TIP****: Screen capture software may use your graphics card for video encoding, which can cause performance issues for Anukari (because it also uses your graphics card). If you find this to be a problem, here are a couple of possible solutions:*

1. *Some screen capture software (like OBS) can be configured to use Software video encoder mode instead of Hardware. Switching to Software may help.*

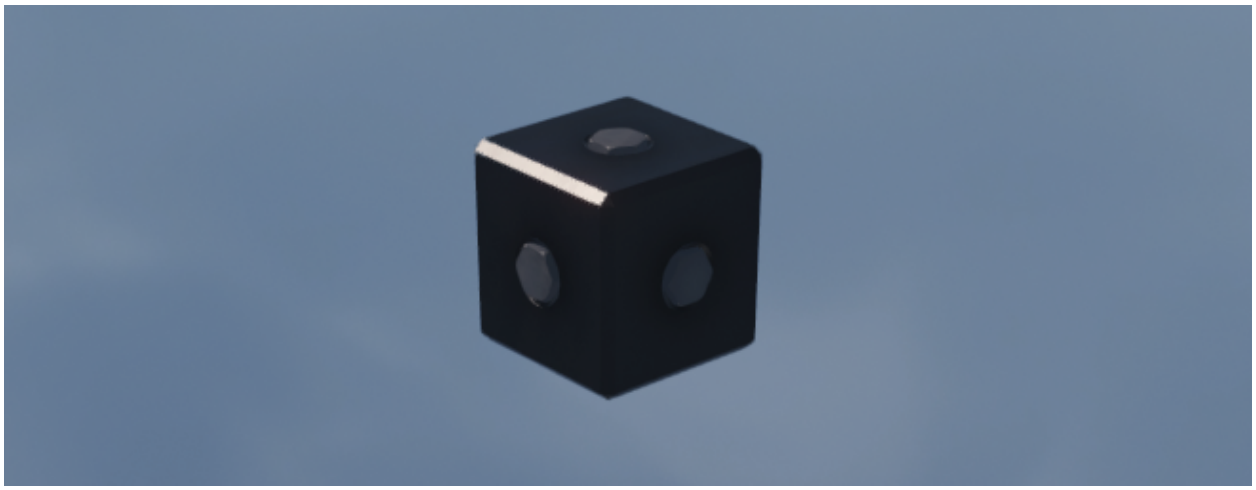
2. *If the screen capture software has an option to disable the preview window, try doing so after ensuring that the capture is lined up properly.*

5. Objects & Properties

Objects are the basic building blocks of Anukari. Within Anukari's virtual 3D space, various objects can be placed and connected together to form what is called a "system." Each system reacts to energy that is introduced via an Exciter or other method. What is meant by "introducing" energy to a system? In the case of Anukari, it means movement—or more specifically, vibration.

Here is a list of all of the objects available within Anukari, including a description of how they react to energy or other objects, and the various parameters that can be used to control them.

Anchor



The Anchor is an immobile object that tethers Body objects together in a system to restrict their movement. Without an Anchor, the entire system of objects will become uncontrollable and fly away in 3D space.

An Anchor can quickly be placed in 3D space by pressing the "A" hotkey

Anchor Properties:

Position: These X, Y, and Z coordinates determine where in 3D space the object is placed. Though the Anchor is "immobile," modulating these parameters will cause the Anchor to move.

Body

The Body object is a principal element for transferring energy throughout a system. It is a freely moving mass that will vibrate when it comes in contact with energy, which generates sound.

A Body object can quickly be placed in 3D space by pressing the “B” hotkey.

Body Properties:

Mass: The physical mass of the Body. Increasing the mass tends to lower the pitch, and vice versa. Body objects with higher mass will be harder to move, and Body objects with lower mass will be flung around easily.

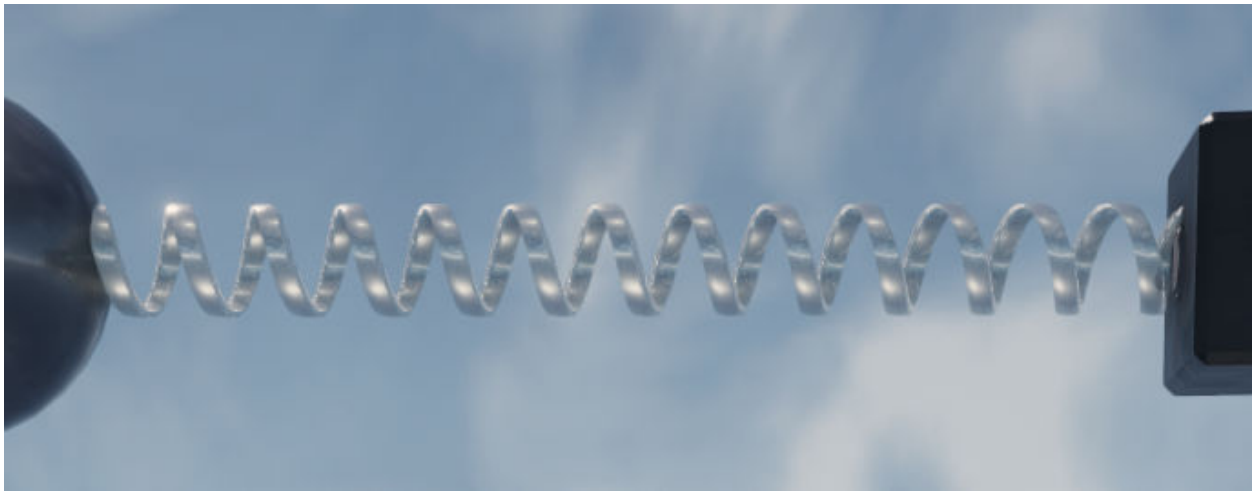
Damping: The physical damping of the Body. This controls how fast the motion of the Body naturally dies down due to loss of energy through, e.g., air resistance. Higher damping will make the motion die down quickly. Set this low for long-ringing tones, or set it high for clicks.

Damping: Note: Controls how much the damping should be scaled based on what note is played. When set to 0, damping will not be scaled, and thus, lower notes will ring out longer than higher notes. When set to 1, damping will be fully scaled, and low/high notes should ring out similarly.

Damping: Mass: Controls how much the damping should be scaled based on the mass of the Body. When set to 0, damping will not be scaled, and thus, body objects with larger mass will ring out longer than those with smaller mass. When set to 1, damping will be fully scaled, and Body objects with large/small mass should ring out similarly.

Rest Position: These X, Y, and Z coordinates determine where in 3D space the object is placed and where it should reside while in a state of rest. Modulating these parameters will make the object move.

Spring



The Spring physically connects Body objects to one another and to Anchors. Each Spring has a configurable neutral length that it is always trying to return to. If it is stretched beyond its neutral length, it will pull the attached Body objects together; if it is compressed below its neutral length, it will push these objects apart.

Springs can be used to quickly connect Body objects and Anchors by clicking on the first object, pressing the “C” hotkey, and then clicking the next object to be connected.

Spring Properties:

Stiffness: This controls how resistant the Spring is to compression or elongation, i.e., how hard it will push/pull on connected Body objects to return to its resting length. Higher stiffness tends towards higher pitch, and vice versa. When attached to a Body with high mass, higher stiffness is required for the same pitch.

Length: The neutral resting length of the Spring. This is the length that the Spring is always trying to return to. When the two Body objects connected by the Spring are at this distance apart, the Spring does not push/pull on them. As the Body objects get closer together than the neutral length, the Spring will push them apart; as the Body objects get further apart than the neutral length, the Spring will pull them together.

Relax Spring Length: This button sets the neutral resting length of the Spring to its current length. This can be used to relax a Spring so that it is no longer under compression or elongation in its current configuration.

Mic & Mic Link

The Mic object is used to pick up vibration from each Body object that it is connected to via a Mic Link line.

The Mic Link connects a Mic to each Body object from which it will pick up vibration. One Mic can be linked to many Body objects and will sum the vibration from all of them. The physical orientation of this link relative to the direction of vibration influences the sound.

The Mic can be quickly placed in 3D space by pressing the “S” hotkey. Mic Links can be added by clicking on the Mic, pressing the “C” hotkey, and then clicking on the Body object to be connected.

Mic Properties:

Gain: The amount of gain that will be applied to the Mic signal.

Pan: Negative values will pan the Mic to the left speaker channel; positive values will pan it toward the right channel. A value of zero is balanced between the left and right channels.

Directionality: Controls how directional the Mic is. A value of 0 produces an omnidirectional Mic, while a value of 1 is highly directional. This can be particularly useful when modulating the Mic's rotation.

Isotropy: Adds distortion by progressively ignoring the particular axis of a Body's vibration—imagine a signal rectifier, but in 3D. Set to 0 for a clean signal.

Ext. Channel: The external audio output channel(s) that the audio signal from this Mic will be sent to. If “<none>” is selected, the Mic will not be mixed into the master output; it will only be sent to internal Delay Lines. For more info, see the section on Delay Lines.

Compressor Threshold: The signal threshold above which the compressor will begin to apply gain reduction (subject to the attack and release durations).

Compressor Ratio: The amount of proportional gain reduction the compressor will apply to the signal when it is above the threshold.

Compressor Attack: The duration for which the signal must be above the threshold before the compressor will apply gain reduction.

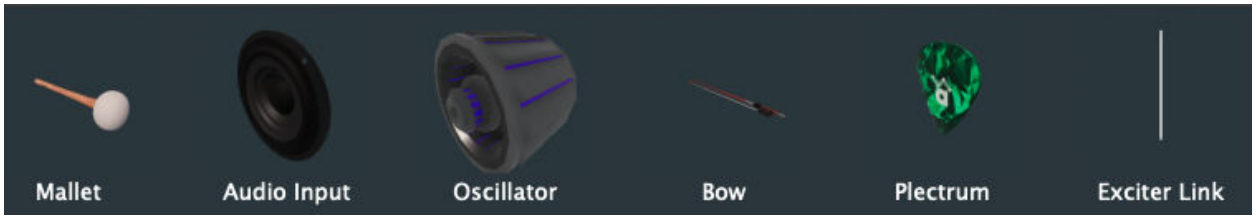
Compressor Release: The duration for which the signal must drop below the threshold before the compressor will stop applying gain reduction.

Compressor Makeup Gain: The amount of gain that will be applied to the signal post-compression.

Orientation: The rotational latitude, longitude, and spin of the entity in 3D space. Modulating these parameters will make the object rotate.

Position: These X, Y, and Z coordinates determine where in 3D space the object is placed. Modulating these parameters will make the object move.

Exciter & Exciter Link



Exciters are the objects that introduce energy into a system. There are currently five types of Exciters that add energy in different ways. Exciters can be quickly placed in 3D space by pressing the “E” hotkey. The mode parameter determines their type.

An Exciter Link connects an Exciter to each Body object in which it will induce vibration when triggered. One Exciter can be linked to many Body objects and will induce vibration in all of them. Exciter Links can be quickly added by clicking on the Exciter, pressing the “C” hotkey, and then clicking on the other object to be connected.

All Exciters share the following parameters, but specific Exciters have their own parameters discussed later on.

MIDI Note: The MIDI channel/note used to trigger the Exciter.

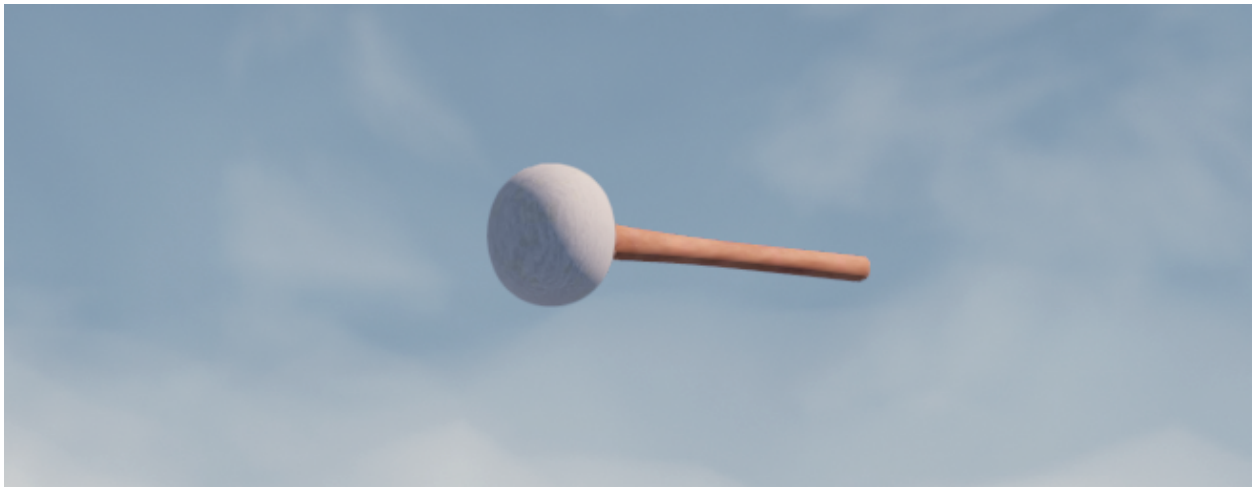
Mode: The physical model used for the Exciter—Mallet, Audio Input, Oscillator, Bow, or Plectrum. Each model has its own behavior and parameters.

Vel. Sensitivity: Adjusts the simple built-in MIDI velocity sensitivity for the Exciter. To fully customize how velocity affects the Exciter, you can set this to zero and connect a Modulator to the Exciter.

Orientation: The rotational latitude, longitude, and spin of the entity in 3D space. Modulating these parameters will make the object rotate.

Position: These X, Y, and Z coordinates determine where in 3D space the object is placed. Modulating these parameters will make the object move.

Mallet



The Mallet is used to simulate the physical striking of each Body object that is connected to it via an Exciter Link. The orientation of the Mallet controls the direction in which each Body is struck.

Mallet Properties:

Impulse: The total amount of force the Mallet will apply to each Body it is attached to over a brief time period. Higher impulse values tend to produce larger vibrations and thus louder sounds.

Min. Hardness: Controls how hard the head of the Mallet is at minimum MIDI velocity. Small values are more like felt heads, and larger values are more like wood or metal heads. The hardness increases between the min/max based on MIDI velocity.

Max. Hardness: Controls how hard the head of the Mallet is at maximum MIDI velocity. Small values are more like felt heads, and larger values are more like wood or metal heads. The hardness increases between the min/max based on MIDI velocity.

Noise: The amount of white noise to mix into the Mallet's impact with the connected Body objects. This adds a bit of a click to the sound and can help reduce the impulse required to get the same amount of loudness.

Plectrum

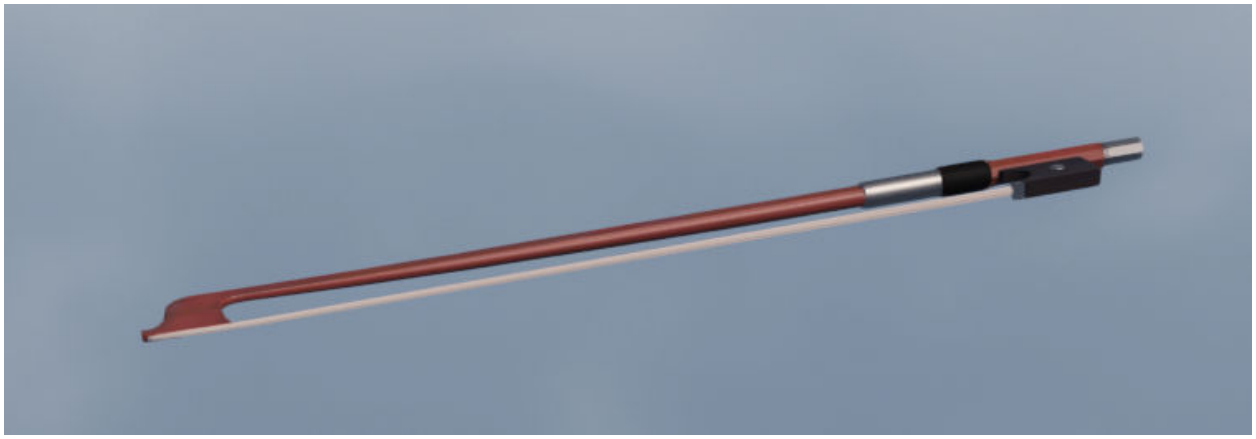
The Plectrum is used to physically pull back and release each Body object that is connected to it via an Exciter Link. The orientation of the Plectrum controls the direction in which each Body is pulled back.

Plectrum Properties:

Distance: The distance by which the connected Body objects will be pulled back (in the direction of the Plectrum) before being released.

Duration: The duration over which the connected Body objects will be pulled back (in the direction of the Plectrum) before being released. Note that while the Body objects are being pulled back, they cannot vibrate normally (e.g., if a Mic is connected to one of these Body objects, it will go mute during this duration). To avoid this, you can apply a very brief duration or connect the Mic to a nearby body instead.

Bow



The Bow is used to simulate the physical bowing of each Body object that is connected to it via an Exciter Link. The orientation of the Bow controls the direction in which each Body is vibrated.

Bow Properties:

Draw Velocity: The velocity with which the Bow is drawn across the connected Body objects. Higher velocity tends towards larger vibrations and thus louder sounds.

Rosin Stiction: Controls how strongly the Bow's rosin sticks to the string. Higher stiction tends to lead to odder harmonics, or a harsher sound.

Rosin Dropoff: Controls how quickly the rosin's stickiness drops off when the Bow's rate of movement is different from the connected Body's movement. If the Bow is not making sound, then you may need to experiment with different values for this parameter.

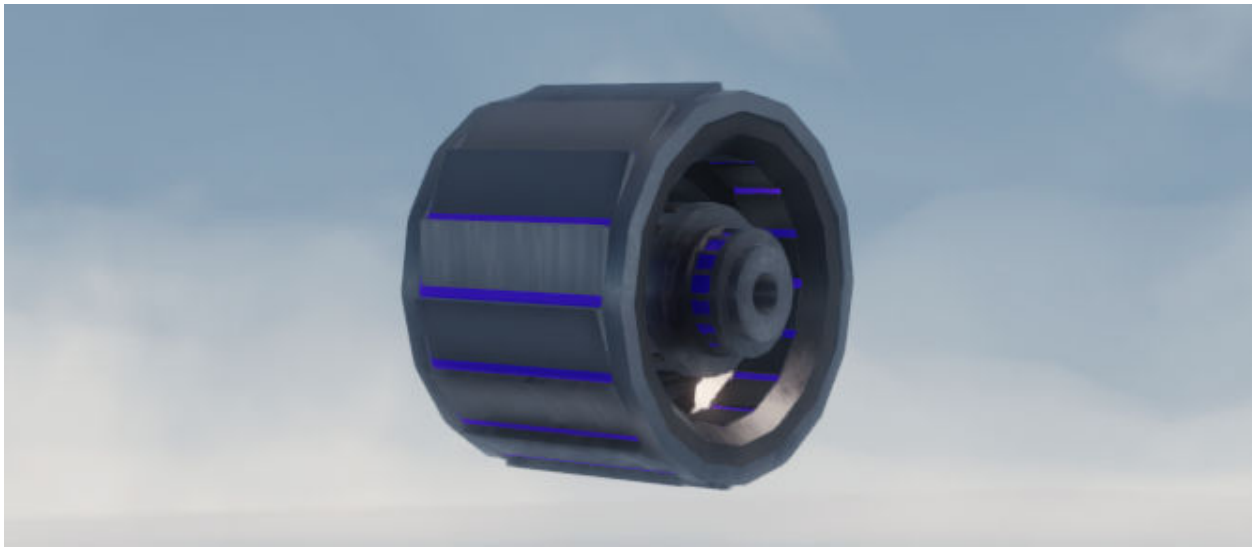
Envelope Attack: When the MIDI note is pressed, this is the duration it takes for the envelope to increase from minimum to maximum gain.

Envelope Decay: After the attack phase of the envelope is finished, this is the duration it takes for the envelope to drop from full gain to sustain gain.

Envelope Sustain: After the decay phase of the envelope is finished, this is the fraction of maximum gain that the envelope will sustain.

Envelope Release: When the MIDI note is released, this is the duration it takes for the envelope to decrease from sustain gain to minimum gain.

Oscillator



The Oscillator is used to induce vibration based on a waveform in each Body object that is connected to it via an Exciter Link. The orientation of the Oscillator controls the direction in which each Body is vibrated.

Oscillator Properties:

Gain: The amount of gain that will be applied to the Oscillator waveform before it is applied as a directional force to connected Body objects.

Shape: The type of waveform that the Oscillator will generate. Options are Sine, Sawtooth, Square, White Noise, and Sample & Hold.

Octave: The number of octaves by which to raise or lower the pitch of the Oscillator.

Semitone: The number of semitones (interval) by which to raise or lower the pitch of the Oscillator.

Detune: The number of cents by which to raise or lower the pitch of the Oscillator.

Pulse Width: When the waveform is set to Square, this is the duty cycle of the wave, or the fraction of time that it is positive. If a Modulator is attached to this Oscillator, then this can be modulated for PWM.

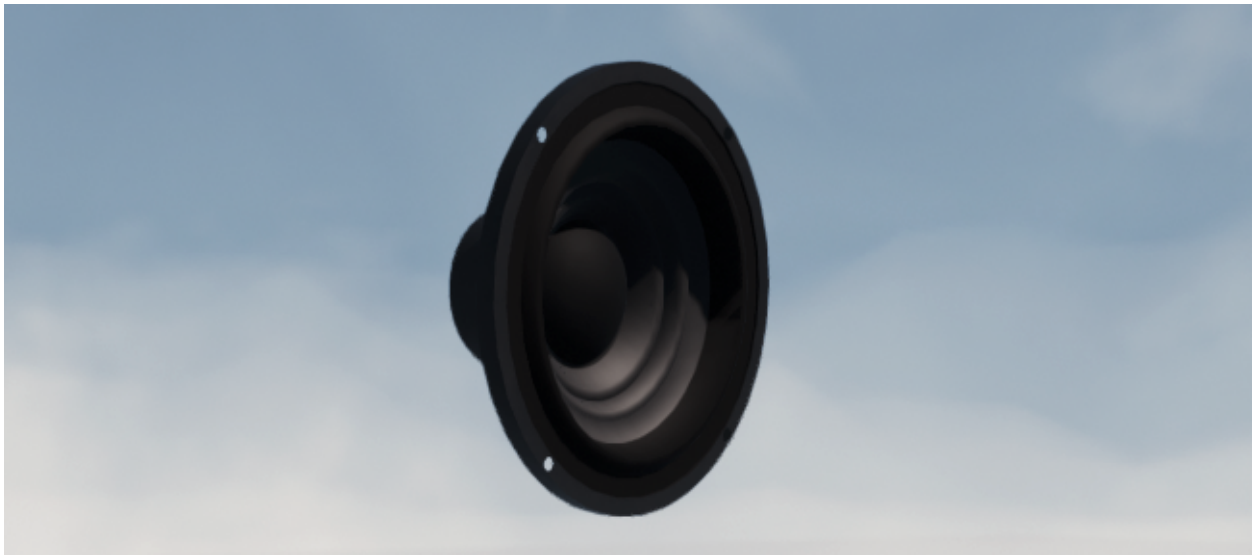
Envelope Attack: When the MIDI note is pressed, this is the duration it takes for the envelope to increase from minimum to maximum gain.

Envelope Decay: After the attack phase of the envelope is finished, this is the duration it takes for the envelope to drop from full gain to sustain gain.

Envelope Sustain: After the decay phase of the envelope is finished, this is the fraction of maximum gain that the envelope will sustain.

Envelope Release: When the MIDI note is released, this is the duration it takes for the envelope to decrease from sustain gain to minimum gain.

Audio Input



The Audio Input is used to induce vibration based on an audio signal in each Body object that is connected to it via an Exciter Link. The orientation of the Audio Input controls the direction in which each Body is vibrated. The audio signal can come from an external input source (e.g., your computer's microphone) or from an internal source by connecting one or more Mics via Delay Lines. For more info, see the section on Delay Lines.

Audio Input Properties:

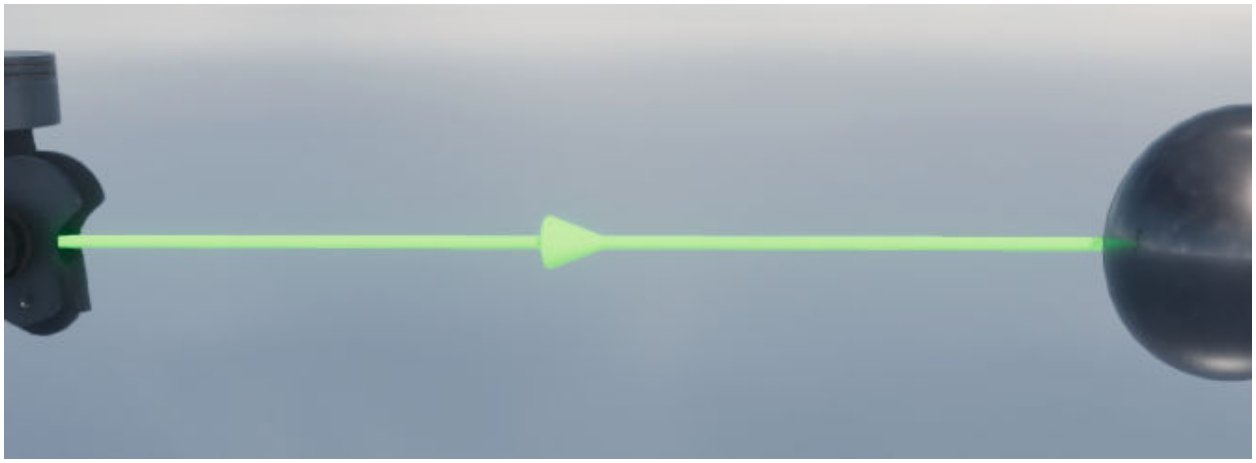
Ext. Channel: The external audio input channel to use for this Audio Input Exciter. If a stereo input is chosen, the stereo channels will be summed into a mono channel. If “<none>” is selected, then the Audio Input Exciter will ignore external signals and will only receive signals from internal Delay Lines.

Gain: The amount of gain that will be applied to the audio signal before it is applied as a directional force to connected Body objects.

Delay: The duration for which the audio signal will be delayed before being applied as a directional force to connected Body objects. This is applied to both external audio signals and Delay Line signals. Note that Delay Lines each have their own delay parameter, which is additive to this one.

MIDI Note Gate: If enabled, the audio signal will be muted except when the associated MIDI note is played, and an envelope will be applied.

Modulator & Modulator Link



Every Modulator uses a Modulator Link to connect to other Objects. This link appears as a green line with an arrow indicating the direction that data is being sent.

Each Modulator Link also has its own parameters, which will appear in the Object properties section when the link is selected.

Modulator Links can be quickly added by clicking on the Modulator, pressing the “C” hotkey, and then clicking on the other Object to be connected.

Target: The target parameter on the connected Object that the Modulator will modulate. Most target parameters match a particular property of the connected Object, but some Objects, like Exciters, can employ special targets like the MIDI Note Trigger. Here is a list of all of the target parameters available to modulate for each Object:

Anchor	Position X, Position Y, Position Z
Body	Mass, Damping
Spring	Stiffness, Neutral Length
Mic	Position X, Position Y, Position Z, Gain, Pan, Rotation Y, Directionality, Isotropy
Mallet	Impulse, Hardness, Noise Amount, Rotation Y, MIDI Note Trigger
Audio Input	Gain, Rotation Y, Delay, MIDI Note Trigger
Oscillator	Frequency, Pulse Width, Gain, Rotation Y, MIDI Note Trigger

Plectrum	Displacement Distance, Displacement Duration, Rotation Y, MIDI Note Trigger
Bow	Draw Velocity, Rosin Stiction, Rosin Dropoff, Rotation Y, MIDI Note Trigger
LFO	Depth, Frequency, Pulse Width, Sync Frequency, MIDI Note Trigger
Envelope Generator	Depth, MIDI Note Trigger
Envelope Follower	Depth, Delay
MIDI Controller	Depth, Smoothing
MIDI Pitch Bend	Depth, Smoothing
MIDI Channel Pressure	Depth, Smoothing
MIDI Poly Aftertouch	Depth, Smoothing
MIDI Velocity	Depth, Smoothing
MIDI Note Follower	Depth, Smoothing
Macro	Depth, Smoothing

MIDI Note Trigger: This is a special target for Exciters that allows a Modulator to use its values to trigger MIDI notes instead of parameter changes.

Depth: The peak amount by which the chosen parameter's value will be modulated. Can be set to negative to negate the polarity of the waveform.

Bias: Adds a constant bias value to the modulation signal.

Multiply: By default, the modulation value is added to the target parameter. When Multiply mode is enabled, the target parameter is multiplied by the modulation value instead. Note that not all target parameters can be multiplied. If a single parameter is the target of both additive and multiplicative modulators, then the additive ones are applied first.

Exponential: Use an exponential curve for the Modulator's application to the target parameter. This is especially useful when modulating parameters that vary over a large range or affect pitch.

Rectify: Applies full-wave rectification to the modulation signal, inverting negative values to make them positive (and keeping positive values unchanged).

Invert: Inverts the polarity of the modulation signal (turns positive to negative and vice versa).

Macro

The Macro uses specific information received from a DAW to modulate parameters for each entity that is connected to it via a Modulator Link.

> ☑ ***TIP:*** *For much more detailed information on how to use the Macro object, see the Using Macros section.*

Macro Properties:

Mode: The type of Modulator being used. Each type has its own parameters and effects.

Smoothing: How long it takes for the Modulator's output value to change when it is updated. Longer values will produce smoother changes with more input lag; smaller values will produce more abrupt changes with less input lag.

Macro Slot: To control this Modulator with one of the Macro knobs in the lower right-hand corner of the Anukari screen, select one of the Macro knob slots here. Multiple Macro objects can be controlled by the same Macro knob.

LFO

The LFO generates a low-frequency oscillator waveform signal to modulate parameters for each entity that is connected to it via a Modulator Link.

LFOs can quickly be placed in 3D space by pressing the “D” hotkey.

LFO Properties:

Mode: The type of Modulator being used. Each type has its own parameters and effects.

Shape: The type of waveform that the LFO will generate.

Tempo Sync: Enable tempo syncing for the LFO frequency to use a specific multiple of the tempo instead of an arbitrary frequency.

Frequency: (When Tempo Sync is disabled) the rate at which the LFO will modulate parameters for connected Objects according to the selected waveform.

Rate: (When Tempo Sync is enabled) the rate at which the LFO will modulate parameters for connected Objects according to the selected waveform, relative to the current tempo.

Pulse Width: When the waveform is set to Square, this is the duty cycle of the wave, or the fraction of time that it is positive.

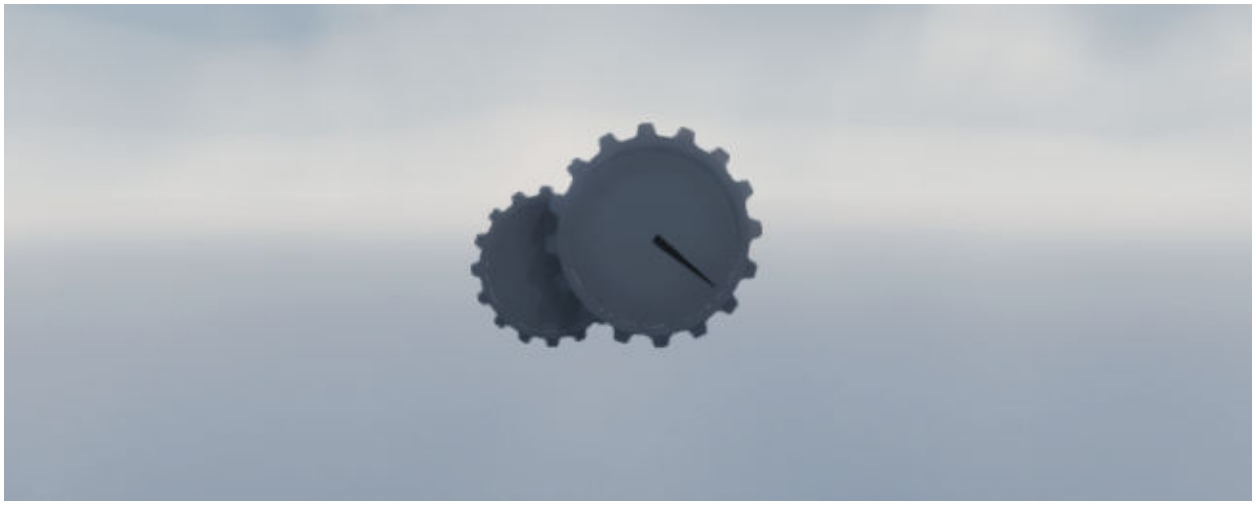
Retrigger: Enable MIDI note retriggering, which will restart the LFO at a specific phase when a selected MIDI note is pressed.

MIDI Note: (When Retrigger is enabled) the MIDI channel/note used to retrigger the LFO.

Retrigger Phase: (When Retrigger is enabled) the state of the phase that the LFO will be reset to.

Scale Frequency: Normally, the LFO's frequency is kept constant regardless of what MIDI note is being played. With this option enabled, the LFO's frequency will instead be scaled based on what note is being played, with higher notes having higher frequencies. One use for this feature is to scale the LFO frequency for FM synthesis.

Envelope Generator



The Envelope Generator creates an envelope based on a MIDI note trigger to modulate parameters for each entity that is connected to it via a Modulator Link.

Envelope Generator Properties:

Mode: The type of Modulator being used. Each type has its own parameters and effects.

MIDI Note: The MIDI channel/note that will trigger this envelope.

Envelope Attack: When the MIDI note is pressed, this is the duration it takes for the envelope to increase from minimum to maximum gain.

Envelope Decay: After the attack phase of the envelope is finished, this is the duration it takes for the envelope to drop from full gain to sustain gain.

Envelope Sustain: After the decay phase of the envelope is finished, this is the fraction of maximum gain that the envelope will sustain.

Envelope Release: When the MIDI note is released, this is the duration it takes for the envelope to decrease from sustain gain to minimum gain.

Envelope Follower

The Envelope Follower uses an audio signal to modulate parameters for each entity that is connected to it via a Modulator Link. The Envelope Follower receives its audio signal from one or more Mics via Delay Lines.

Envelope Follower Properties:

Attack: The approximate amount of time for the Envelope Follower's output to increase to match an input signal if the input signal stays the same for long enough.

Release: The approximate amount of time it takes the Envelope Follower's output to decrease to match an input signal if the input signal stays the same for long enough. Note that for most use cases, this should be longer than the attack time, or else the Envelope Follower will only produce extremely transient output signals. On the other hand, extremely short attack or release may be useful for frequency modulation techniques (or similar).

MIDI Controller

The MIDI Controller input uses a MIDI continuous control signal (knob, fader, etc.) to modulate parameters for each entity that is connected to it via a Modulator Link.

MIDI Controller Properties:

Mode: The type of Modulator being used. Each type has its own parameters and effects.

MIDI Channel: The MIDI channel on which continuous controller (CC) messages will be received by the Modulator.

MIDI CC Number: The MIDI continuous controller (CC) number for the knob/fader/etc. that will control the Modulator.

Sense: Click here to assign the MIDI channel and controller number by wiggling the input on the controller of your choice (e.g., knob, fader, pedal, etc.).

Smoothing: How long it takes for the Modulator's output value to change when it is updated. Longer values will produce smoother changes with more input lag; smaller values will produce more abrupt changes with less input lag.

MIDI Pitch Bend

The MIDI Pitch Bend input uses a MIDI pitch bend signal to modulate parameters for each entity that is connected to it via a Modulator Link.

MIDI Pitch Bend Properties:

Mode: The type of Modulator being used. Each type has its own parameters and effects.

MIDI Channel: The MIDI channel on which continuous controller (CC) messages will be received by the Modulator.

Sense: Click here to assign the MIDI channel and controller number by wiggling the input on the controller of your choice (e.g., knob, fader, pedal, etc.).

Smoothing: How long it takes for the Modulator's output value to change when it is updated. Longer values will produce smoother changes with more input lag; smaller values will produce more abrupt changes with less input lag.

MIDI Velocity

The MIDI Velocity input uses a MIDI velocity signal (ON or OFF) to modulate parameters for each entity that is connected to it via a Modulator Link.

MIDI Velocity Properties:

Mode: The type of Modulator being used. Each type has its own parameters and effects.

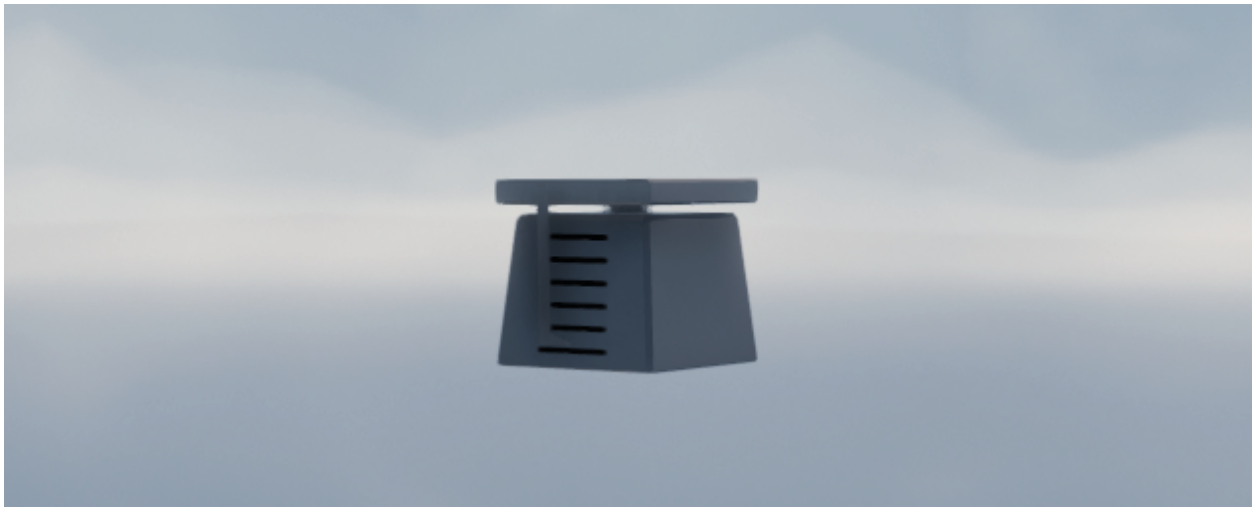
MIDI Channel: The MIDI channel on which continuous controller (CC) messages will be received by the Modulator.

Velocity Phase: Controls whether the Modulator will output the MIDI note “ON” velocity or “OFF” velocity.

Sense: Click here to assign the MIDI channel and controller number by wiggling the input on the controller of your choice (e.g., knob, fader, pedal, etc.).

Smoothing: How long it takes for the Modulator's output value to change when it is updated. Longer values will produce smoother changes with more input lag; smaller values will produce more abrupt changes with less input lag.

MIDI Poly Aftertouch



The Midi Poly Aftertouch input uses a MIDI aftertouch signal to modulate parameters for each entity that is connected to it via a Modulator Link.

MIDI Poly Aftertouch Properties:

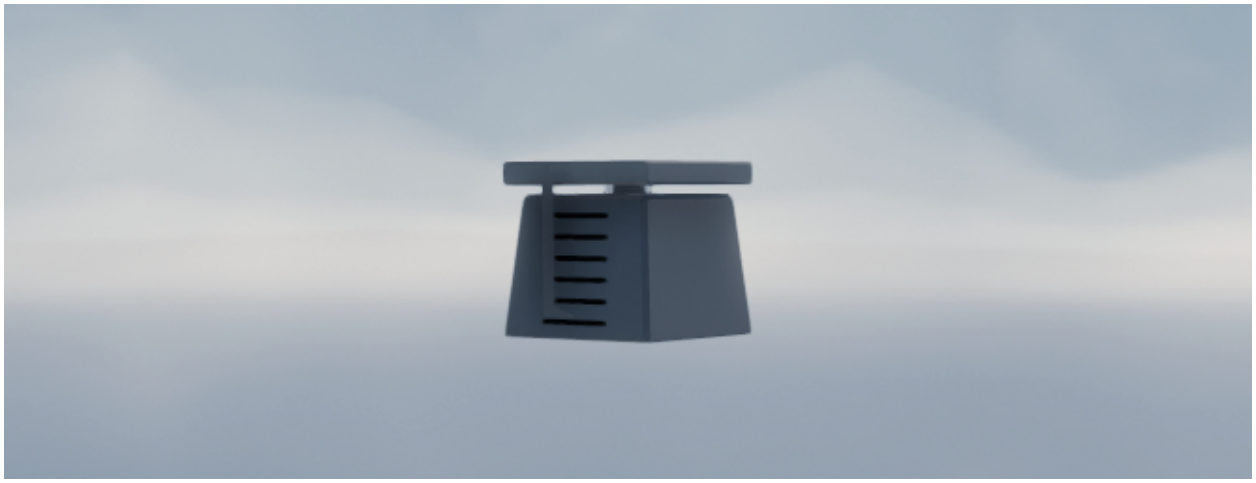
Mode: The type of Modulator being used. Each type has its own parameters and effects.

MIDI Channel: The MIDI channel on which continuous controller (CC) messages will be received by the Modulator.

Sense: Click here to assign the MIDI channel and controller number by wiggling the input on the controller of your choice (e.g., knob, fader, pedal, etc.).

Smoothing: How long it takes for the Modulator's output value to change when it is updated. Longer values will produce smoother changes with more input lag; smaller values will produce more abrupt changes with less input lag.

MIDI Channel Pressure



The MIDI Channel Pressure input uses a MIDI channel pressure signal to modulate parameters for each entity that is connected to it via a Modulator Link.

MIDI Channel Pressure Properties:

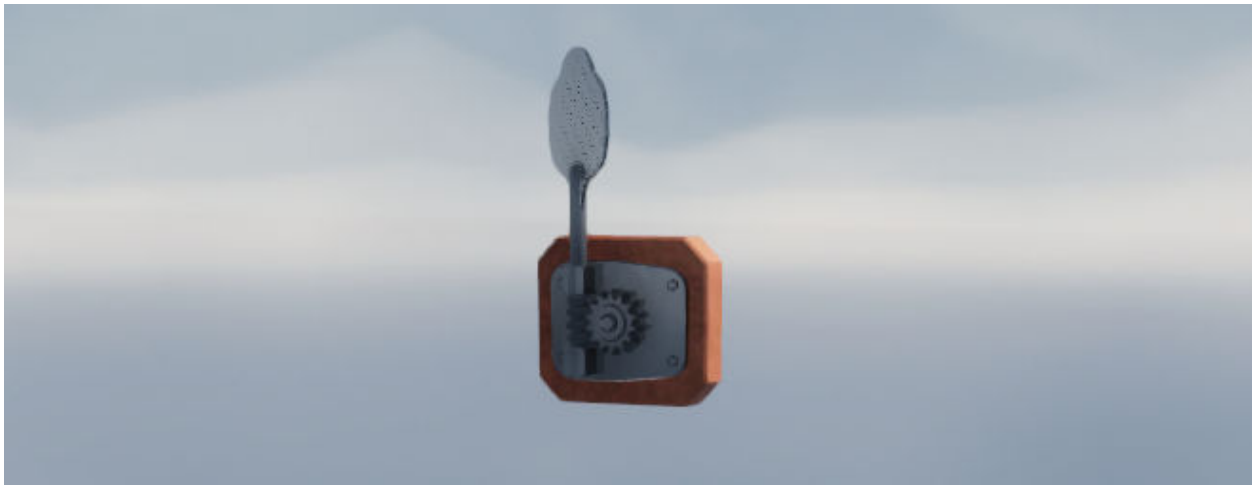
Mode: The type of Modulator being used. Each type has its own parameters and effects.

MIDI Channel: The MIDI channel on which continuous controller (CC) messages will be received by the Modulator.

Sense: Click here to assign the MIDI channel and controller number by wiggling the input on the controller of your choice (e.g., knob, fader, pedal, etc.).

Smoothing: How long it takes for the Modulator's output value to change when it is updated. Longer values will produce smoother changes with more input lag; smaller values will produce more abrupt changes with less input lag.

MIDI Note Follower



The MIDI Note Follower converts the current MIDI note into a signal to modulate parameters for each entity that is connected to it via a Modulator Link. The signal it generates is unity for a configurable reference note, and it doubles/halves for each octave up/down the note goes.

MIDI Note Follower Properties:

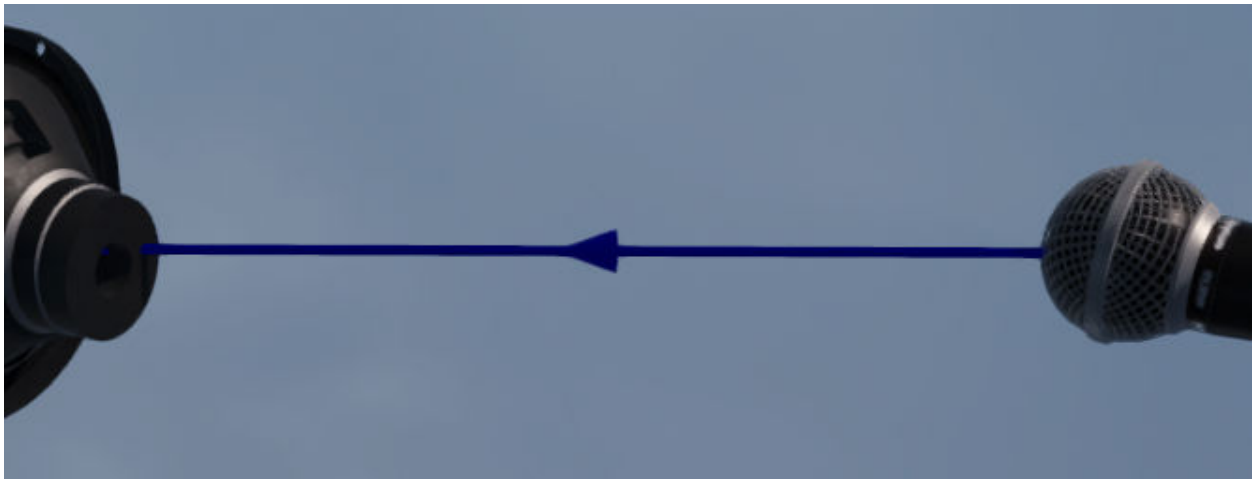
Mode: The type of Modulator being used. Each type has its own parameters and effects.

Reference Note: The Note Follower will output: zero if the reference note is pressed, negative values if the note is lower than the reference note, and positive values if the note is higher than the reference note. If you are using the Note Follower to control pitch, then you may wish to set the reference note to the natural pitch that the system generates without modulation.

Sense: Click here to assign the MIDI channel and controller number by wiggling the input on the controller of your choice (e.g., knob, fader, pedal, etc.).

Smoothing: How long it takes for the Modulator's output value to change when it is updated. Longer values will produce smoother changes with more input lag; smaller values will produce more abrupt changes with less input lag.

Delay Line



The Delay Line connects an Audio Input Exciter or Envelope Follower to each of the Mics from which it will receive an audio signal. They appear as blue lines with an arrow indicating the direction of audio signal flow. An Audio Input or Envelope Follower can be connected to many Mics, and will sum the audio signal from all of them. The Delay Line link is used to configure the delay for each Mic's audio signal.

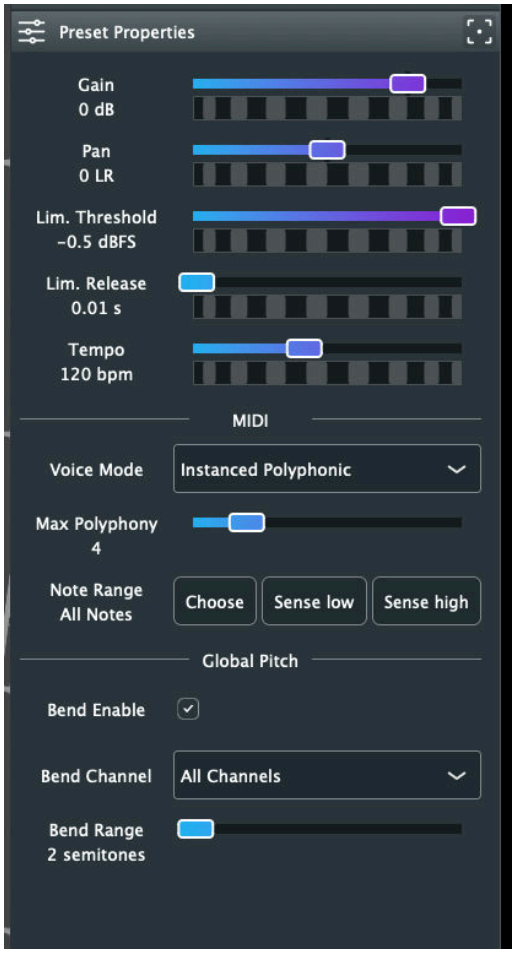
Delay Lines can be quickly added by clicking on the Audio Input Exciter, pressing the “C” hotkey, and then clicking on the Mic object to be connected.

Delay Line Properties:

Delay: The duration for which the audio signal picked up by the connected Mic will be delayed before being sent to the connected Audio Input Exciter. Note that the Audio Input Exciter itself has its own delay parameter, which is additive to this one.

6. Preset Properties

Every preset has a set of parameters that apply to the overall sound and function of the preset. These controls affect the overall volume, MIDI, and other master settings found in the Preset Properties section.



Gain: The amount of gain that will be applied to the master output signal.

Pan: Negative values will pan the audio output to the left speaker channel; positive values will pan it toward the right channel. A value of zero will be balanced between the left and right channels.

Dry/Wet: This controls the output mix between the completely “dry” input signal (value of 0) and the fully processed “wet” input signal (value of 1). Note: This is only available with the AnukariEffect plugin.

Lim. Threshold: The signal threshold above which the master brickwall limiter will reduce gain.

Lim. Release: The duration over which the master brickwall limiter will drop gain reduction once the signal has dropped below the threshold.

Tempo: The tempo (in beats per minute) of the main beat clock, which is used for features like synced LFOs. When running Anukari in plugin mode, the tempo is set by the plugin host (DAW) instead.

MIDI Section

Voice Mode: The global MIDI control mode affects how Anukari responds to MIDI inputs.

In Singleton mode, you explicitly choose which MIDI note is mapped to each Exciter/Modulator; e.g., if you wish to play a scale, then you will need to design an instrument with an Exciter for each note. This mode requires the most work to create an instrument, but gives you total control.

In Instanced (Polyphonic) mode, the instrument you make is automatically instanced and mapped to all MIDI notes. The number of voice instances controls the maximum polyphony.

In MIDI Polyphonic Expression (MPE) mode, the instrument is set up for compatibility with MPE devices such as the Roli Seaboard or Linnstrument.

Max Polyphony: The number of distinct notes that can be played at a time before the least recently played note will be replaced by a new note. Larger values use more system resources and are more taxing on the GPU.

Note Range: This sets the lowest and highest MIDI notes that the instrument will respond to. This can be useful, for example, to prevent the instrument from responding to high notes that you have determined are likely to cause physics explosions.

Click the “Choose...” button to manually assign the note range for the preset using an on-screen piano keyboard. Click “Sense Low...” to assign the lowest note for the preset by pressing any note on your MIDI input device. Click “Sense High...” to assign the highest note for the preset by pressing any note on your MIDI input device.

Global Pitch Section

Bend Enabled: Whether MIDI pitch bend messages should be automatically applied globally to the instrument. You may wish to disable this if you are using pitch bend as a modulation source and want full control.

Bend Channel: The MIDI channel on which to receive pitch bend messages.

Bend Range: The number of semitones (up and down) of pitch bend range for global MIDI pitch bend messages.

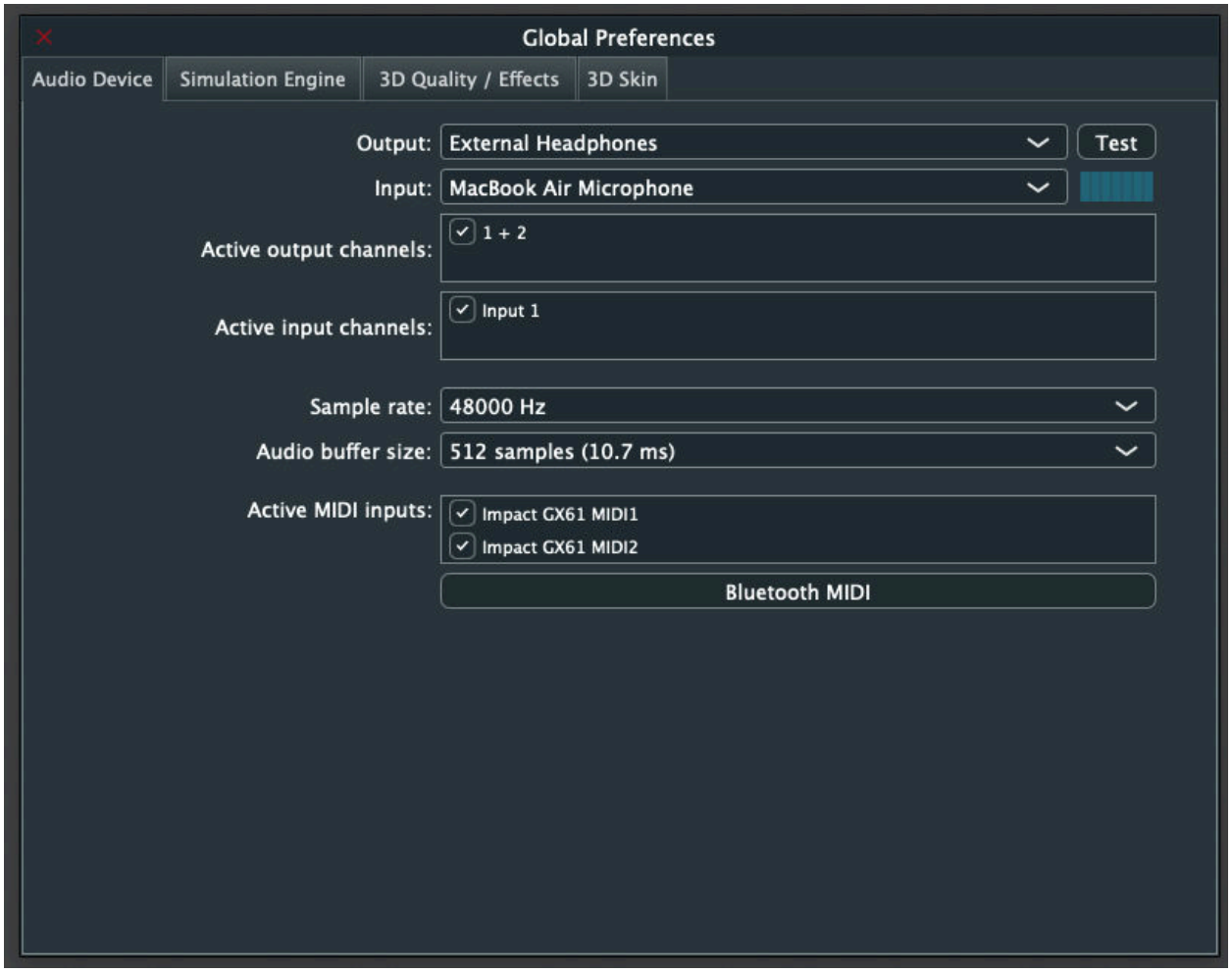
Transpose Section

Octave: The number of octaves by which to raise or lower the pitch of the entire preset. Careful! Depending on the preset, large values may cause physics explosions.

Semitone: The number of semitones (interval) by which to raise or lower the pitch of the entire preset.

Detune: The number of cents by which to raise or lower the pitch of the entire preset.

7. Global Preferences



The Global Preferences window contains various application settings that determine how Anukari works on your computer. It can be accessed by clicking on “Options” in the menu bar and then selecting “Preferences.”

The settings are categorized into four tabs. First is the “Audio Device” tab with the following options. [Note: This tab only appears for the standalone version of Anukari. The plugin version of Anukari uses the audio device settings from its host DAW.]

Output: This is the device that Anukari will use to output its sound.

Input: This is the device that Anukari will use for bringing input signals (like a microphone or guitar signal) into the app.

Active Output Channels: Some devices have multiple channels for outputting sound. Here, a user can select which one(s) they wish to use with Anukari.

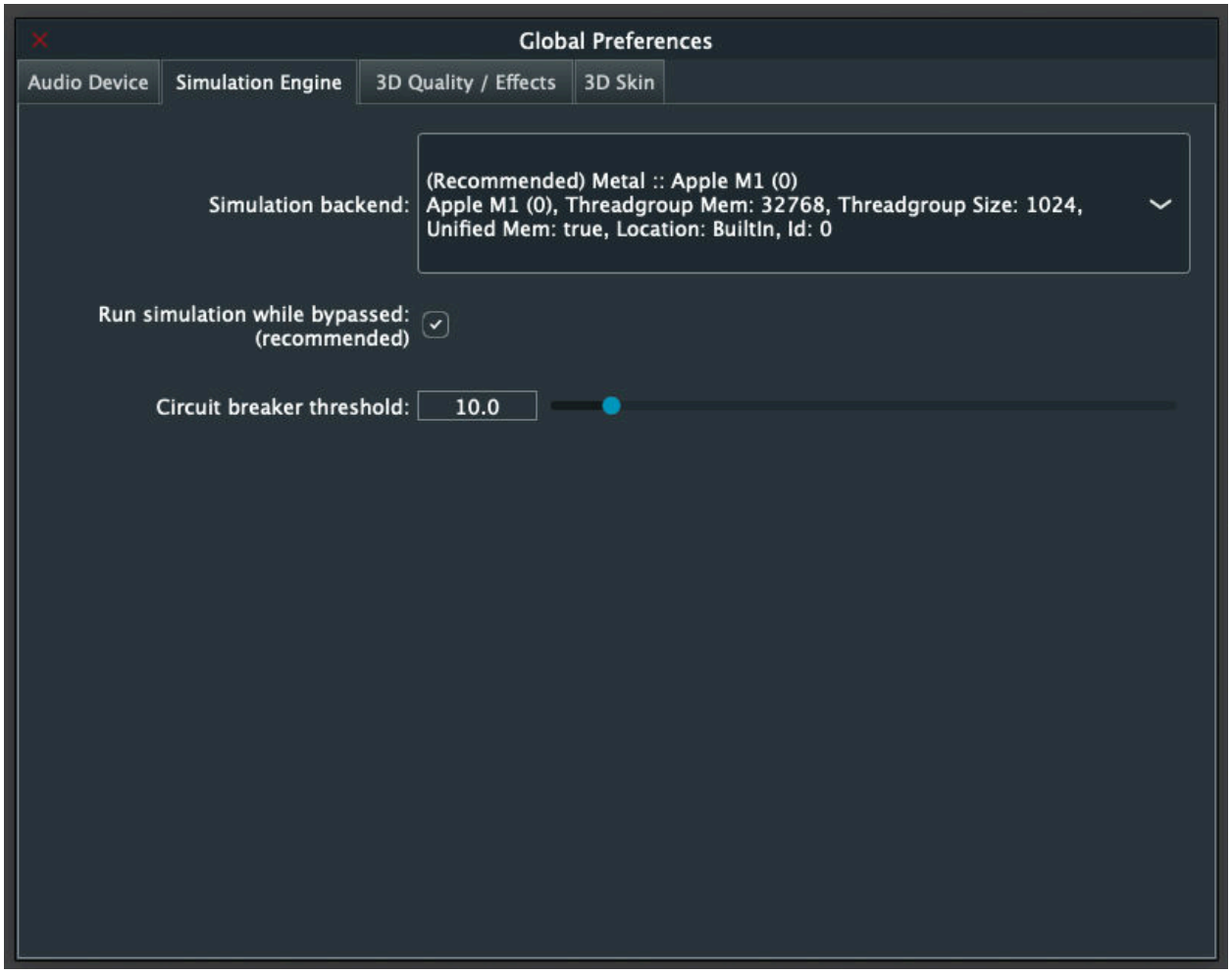
Active Input Channels: Some devices have multiple channels for inputting sound. Here, a user can select which one(s) they wish to use with Anukari.

Sample Rate: This selects the digital sample rate that Anukari will use to generate sound.

Audio Buffer Size: To reduce input/output latency, the buffer size should be reduced to as low as possible. However, lower buffer settings will increase your computer's workload. It is best to find a balance between the buffer and processing, which will vary from computer to computer. For more info, see the section on Plugin Performance.

Active MIDI Inputs: These are the MIDI devices that can be used with Anukari. Checking the device will enable it for use within Anukari.

Bluetooth MIDI: This will allow Anukari to scan for any MIDI devices that are Bluetooth-enabled (macOS only).



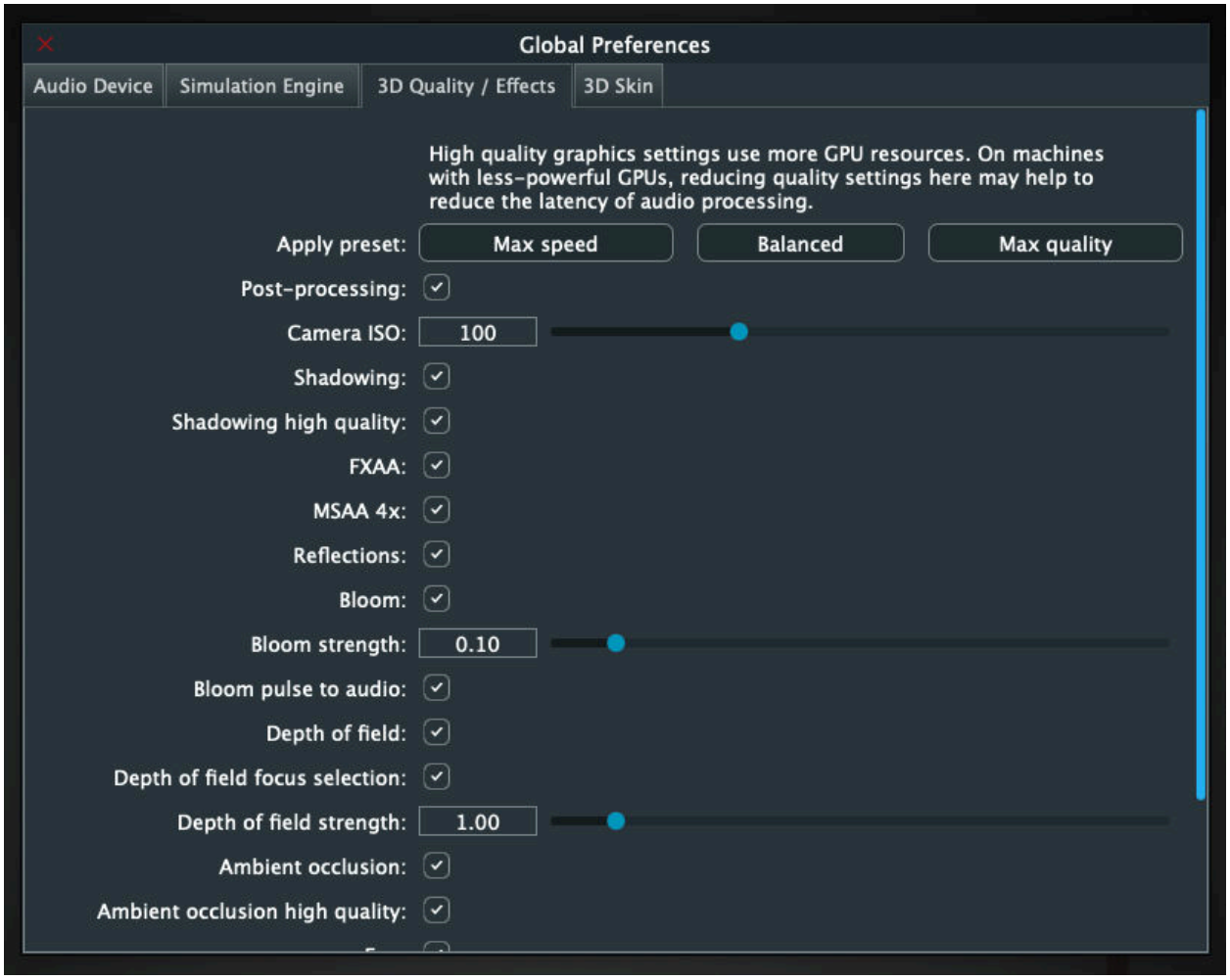
The next tab is labeled “Simulation Engine” and offers options related to how Anukari renders its 3D environment, the objects within it, and their interactions according to Anukari’s physics modeling.

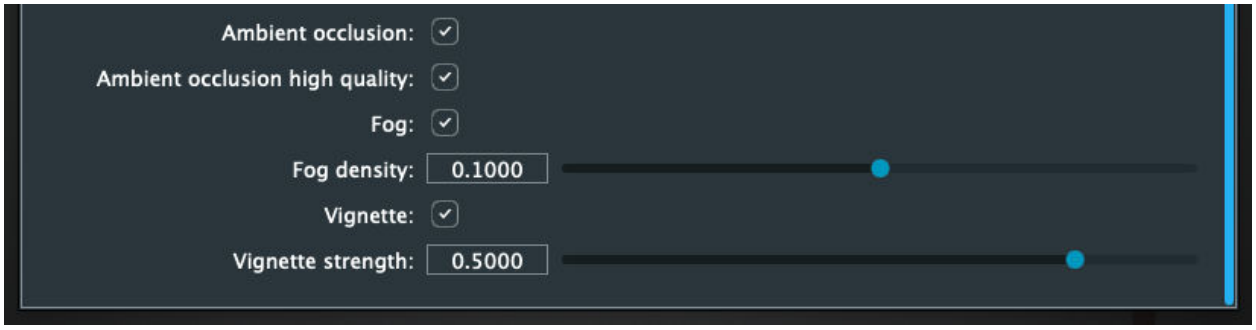
Simulation Backend: Selects the GPU backend to use for processing the physics simulation. The recommended backend should be automatically selected. This setting should only need to be changed for advanced use cases, such as on machines with multiple GPUs. Other than for exceptional use cases, it's best to use the recommended backend.

Run simulation while bypassed (recommended): Some DAWs will bypass plugins automatically to save CPU, such as when the track for an effect plugin is not being played, or when an instrument has not recently received a MIDI event. When this option is enabled, Anukari will continue the physics simulation even when bypassed. It is strongly recommended that this option be left ON. When this option is off, Anukari's physics will

not function correctly while bypassed, and there may be clicks/pops when the DAW removes the automatic bypass.

Circuit Breaker Threshold: The Circuit Breaker pauses playback when RMS loudness exceeds this level, to protect your ears. Lower values make it more sensitive. The recommended level is 10.0. For more info, see the Circuit Breaker section.





Settings in the “3D Quality / Effects” tab will determine the quality of the virtual 3D space and objects within it.

Apply Preset: Select one of these preset buttons to automatically choose settings for speed vs. performance. This will overwrite any settings you've chosen manually below.

Post-Processing: Post-processing enables color correction and is also required for configuring some of the effects below.

Camera ISO: The light-sensitivity level for the camera. Higher numbers will make the scene brighter. An ISO of 100 is the recommended default.

Shadowing: Shadows add realism at moderate rendering cost.

Shadowing High Quality: High-quality shadows look better but have a high rendering cost.

FXAA: Fast Approximate Anti-Aliasing: reduces jagged pixel edges with small rendering cost and some blurring.

MSAA 4x: Multisample Anti-Aliasing: accurately reduces jagged pixel edges with high rendering cost.

Reflections: Reflection allows shiny objects to reflect nearby objects instead of just the skybox, at high rendering cost.

Bloom: Bloom adds blurry spots and lens flare when a bright spot is visible, at moderate rendering cost.

Bloom Strength: Adjust how strong the bloom effect is.

Bloom Pulse to Audio: Pulse the bloom strength based on the master audio output level.

Depth of Field: Depth of field makes objects that the camera is not focused on blurry, at high rendering cost.

Depth of Field Focus Selection: Focus the camera's depth of field effect on the currently selected objects. Disable this to choose a static focus distance.

Depth of Field Distance: The distance from the camera at which the focus is set. Objects at this distance will be sharp, and objects nearer/further will be progressively more blurry.

Depth of Field Strength: Adjusts the strength of the depth of field blur effect.

Ambient Occlusion: Ambient occlusion shades objects more realistically at a small rendering cost.

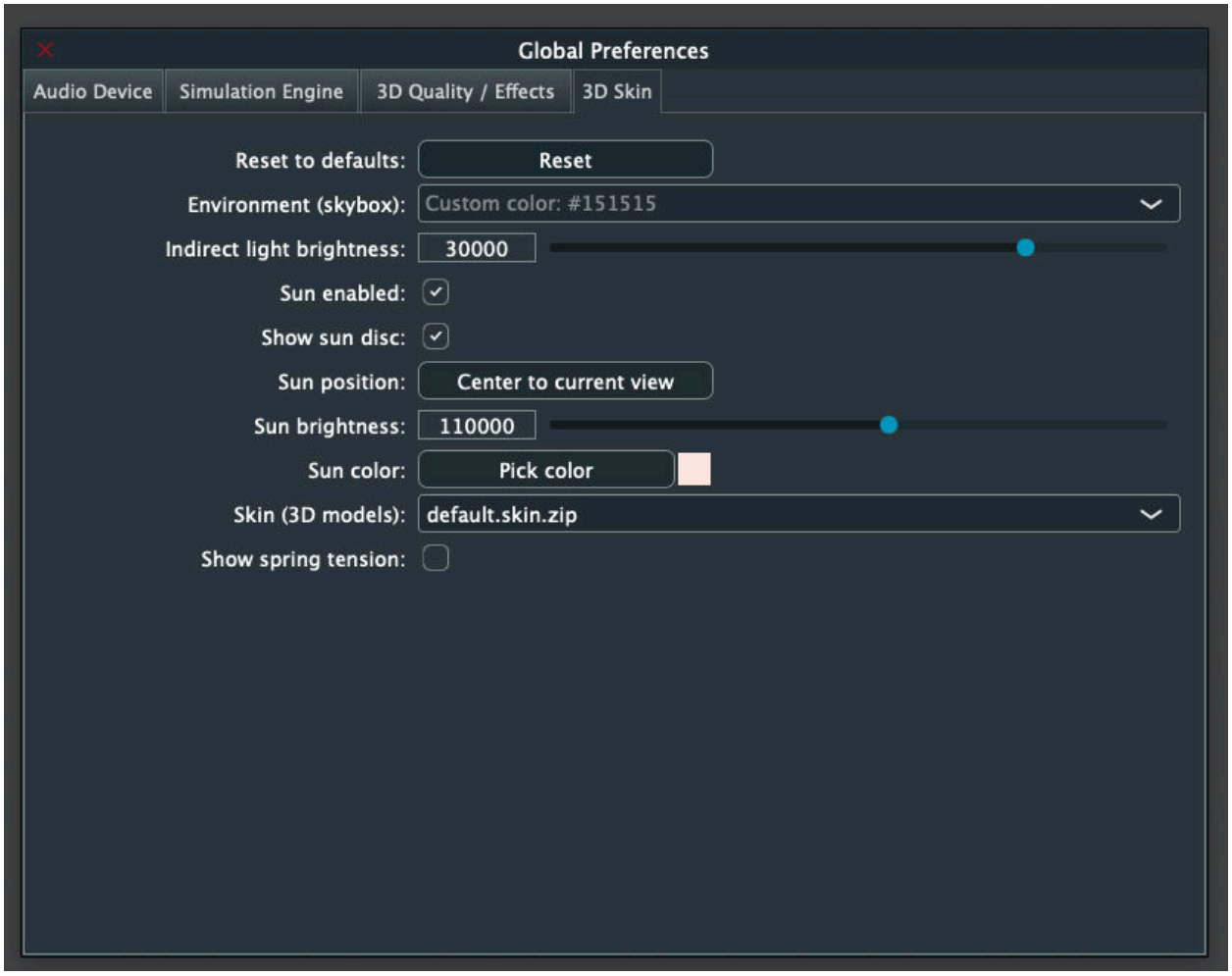
Ambient Occlusion High Quality: High-quality ambient occlusion optimizes visuals at a high rendering cost.

Fog: Enables a simple but fairly unrealistic fog model at a small rendering cost.

Fog Density: Adjusts how dense the fog is.

Vignette: Enables a darkening of the corners of the screen for a vignette effect.

Vignette Strength: Adjusts how much of the screen the vignette effect covers.



With the “3D Skin” settings, you can customize the look of Anukari’s graphical interface.

Reset To Defaults: Resets the settings below to their factory default values.

Environment (Skybox): Changes the appearance of the environment, including the skybox and ambient lighting.

Indirect Light Brightness: Adjusts the intensity of the environment's indirect lighting (in lux). A value of 30,000 would be typical for a daytime outdoor scene.

Sun Enabled: Toggles whether sunlight is enabled. If this setting is off, then the instrument will only be lit via indirect environmental lighting.

Show Sun Disc: Toggles whether a representation of the sun's disc should be visually rendered in the sky. Light from the sun is emitted regardless of this setting.

Sun Position: Changes the position of the sun's visible disc (and its light direction) to the center of the current 3D camera view.

Sun Brightness: Adjusts the intensity of the sun (in lux). A value of 110,000 would be typical for a daytime outdoor scene.

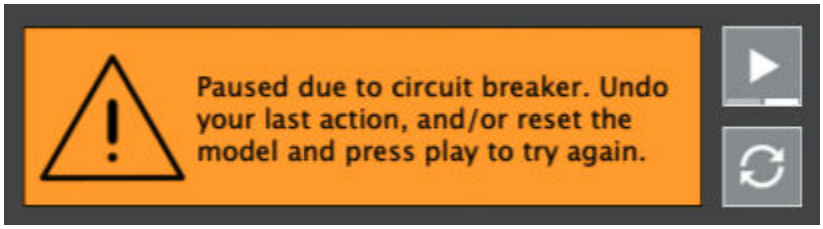
Sun Color: Choose the color of the light emitted by the sun and its visible disc.

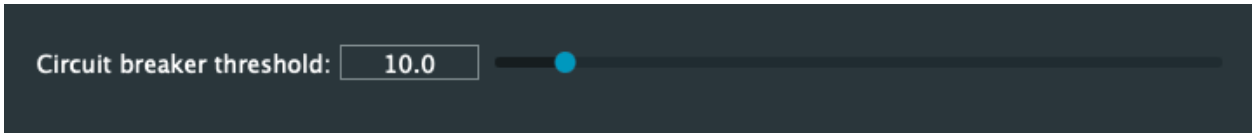
Skin (3D models): Changes the appearance of the physics objects, such as the 3D models for the Bodies, Springs, Mallets, etc.

Show Spring Tension: Toggles whether Springs should be colored red when under tension (stretched) and green when under compression (squished).

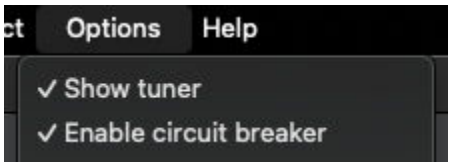
8. Other Features

Circuit Breaker





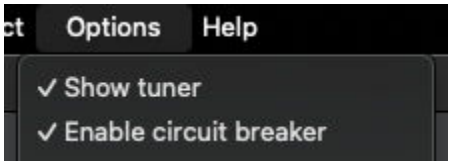
The Circuit Breaker is a failsafe mechanism built into Anukari to prevent a “flood” of volume from escaping the app (and into the user’s speakers and/or ears). It will automatically pause playback of Anukari’s simulation engine whenever RMS loudness exceeds the level set by the Circuit Breaker Threshold setting in Global Preferences. Lower values make the Circuit Breaker more sensitive and will therefore trigger the failsafe more often. The recommended level is 10.0.



The Circuit Breaker can be enabled and disabled via the “Enable Circuit Breaker” setting located within the Options section of the menu bar.

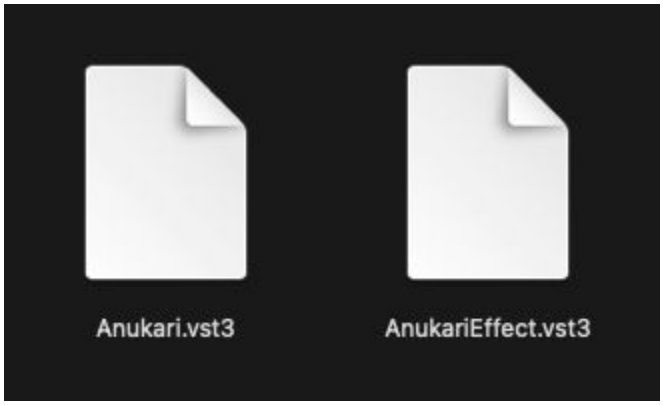
Tuner

This is the tuner for Anukari. It registers pitch for any audio that plays from the app. The tuner is used for tuning preset objects and/or systems to specific notes.



To show the tuner on the main window, enable the “Show Tuner” setting located within the Options section of the menu bar.

Anukari vs. AnukariEffect



Anukari is capable of not only generating audio as an instrument but also processing external audio signals through its systems of objects. In the latter use, Anukari can be utilized as an effects plugin. It is important to note that each use of Anukari has its own respective plugin version.

The plugin labeled “Anukari” is used as an instrument plugin.

The plugin labeled “AnukariEffect” is used as an effects plugin.

Plugin Performance

Due to its use of GPU and other resources, Anukari's performance can vary from computer to computer. To better configure the application for your particular system, you can adjust certain settings found in the Global Preferences window.

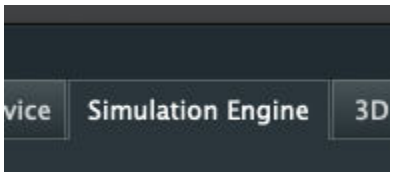
Audio Buffer Size

This setting is located under the Audio Device tab. It controls the size of the audio buffer used to process digital audio.

Think of the audio buffer as a bucket that needs to be filled before any sound can be heard. If the bucket is small, then sounds will be heard more immediately as they occur because the latency time required to process the digital audio will be shorter. The downside is that this will increase the workload on your computer. A smaller bucket fills faster, but it requires more trips to the well, which means more work.

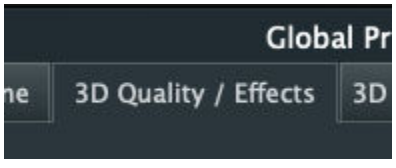
With higher buffer sizes, the bucket will be bigger and will require fewer trips to the well. However, this also means that it will take longer to fill the bucket, so some latency issues may occur. Finding a balance is key. The buffer size should be as low as possible, but not so low that it overworks the computer and causes unwanted noise.

Simulation Engine



This tab contains settings related to how Anukari runs its physics modeling features. How the simulation engine runs greatly affects performance. For more info on each option, see the section on Global Preferences.

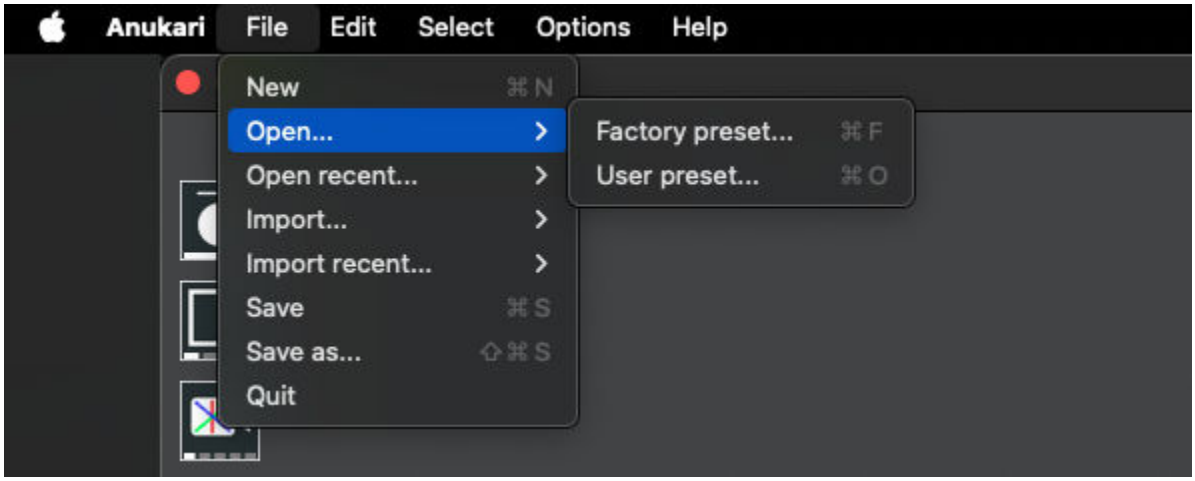
3D Quality / Effects



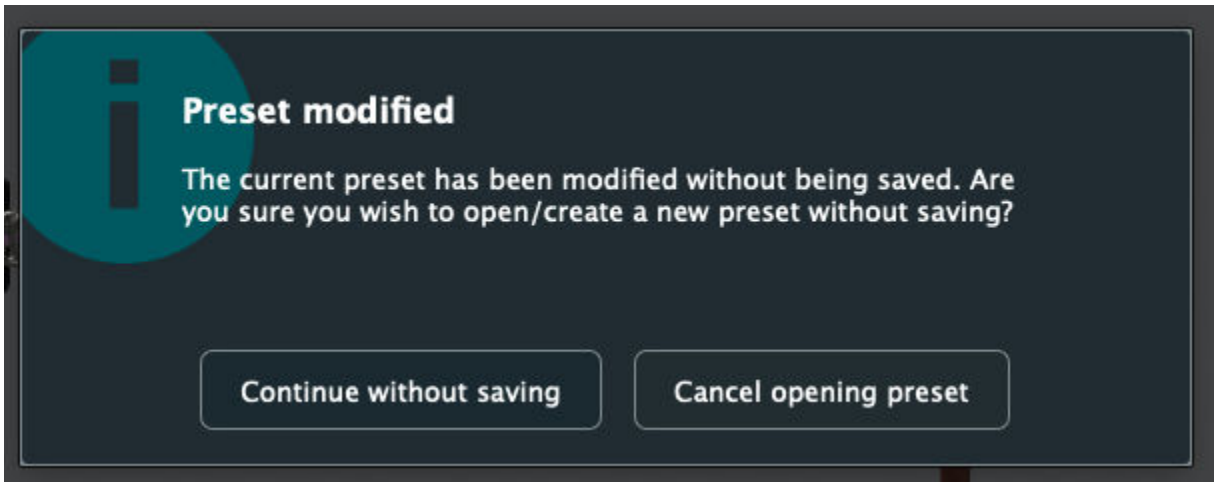
Settings in this tab control how Anukari displays the graphical content of its 3D space. This includes Objects, textures, lighting, and other elements that configure its GPU usage. Enabling these options will increase the computer's workload. For more info on each option, see the section on Global Preferences.

9. Basic Operations

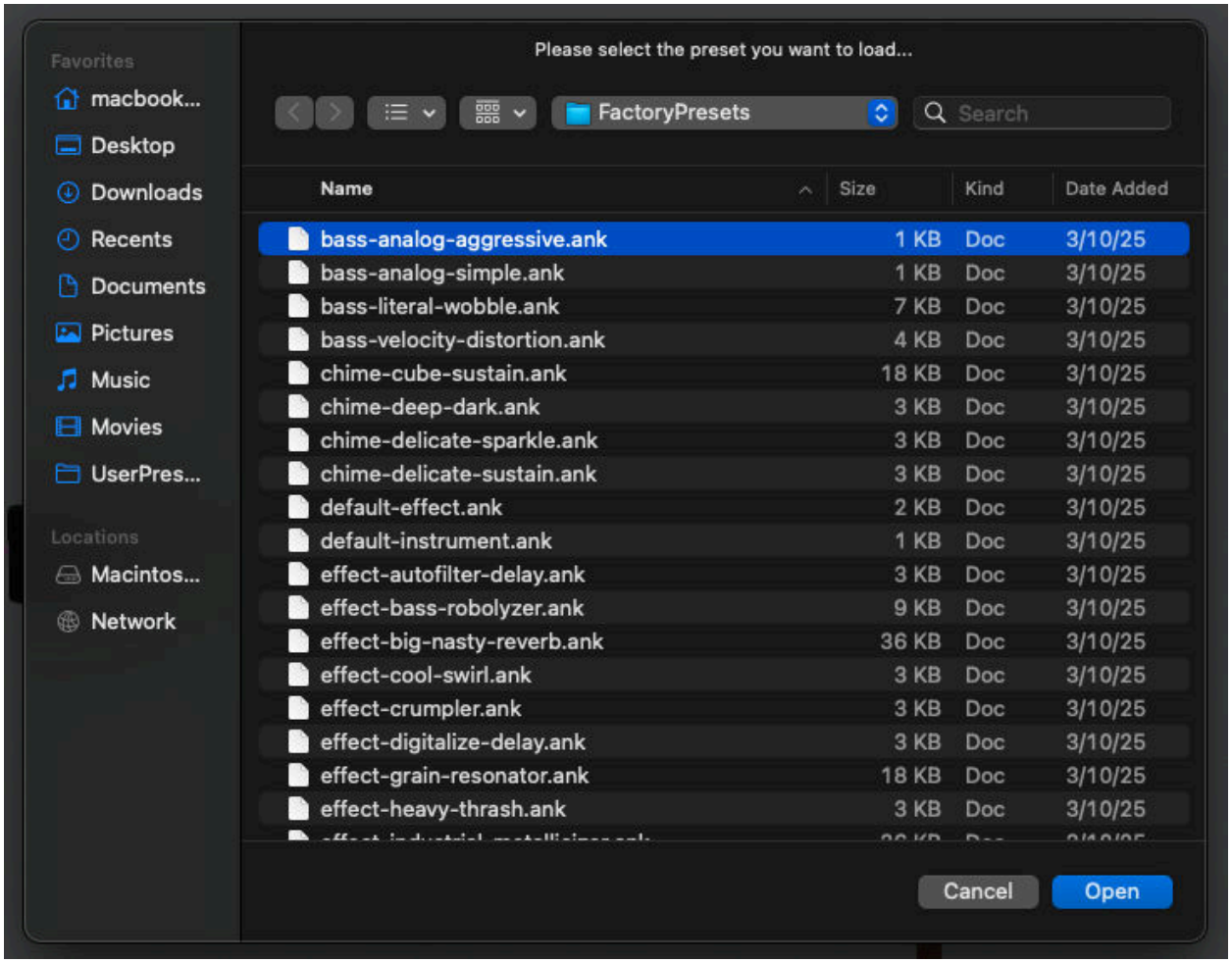
Opening a preset



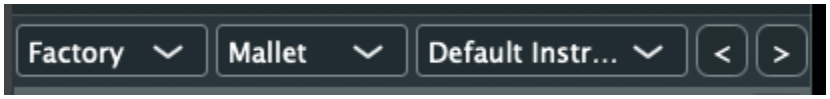
To open a preset in Anukari, click on “File” in the menu bar, select “Open...” and then choose either “Factory Preset...” or “User Preset...” Factory presets are included with Anukari, while user presets are created or added by the user.



If an unsaved preset is currently open, Anukari will ask if you wish to continue without saving or cancel opening the preset. Choosing to continue without saving will load a new preset and discard any changes made to the previous preset. Choosing to cancel opening a new preset will return the user to the current unsaved preset.

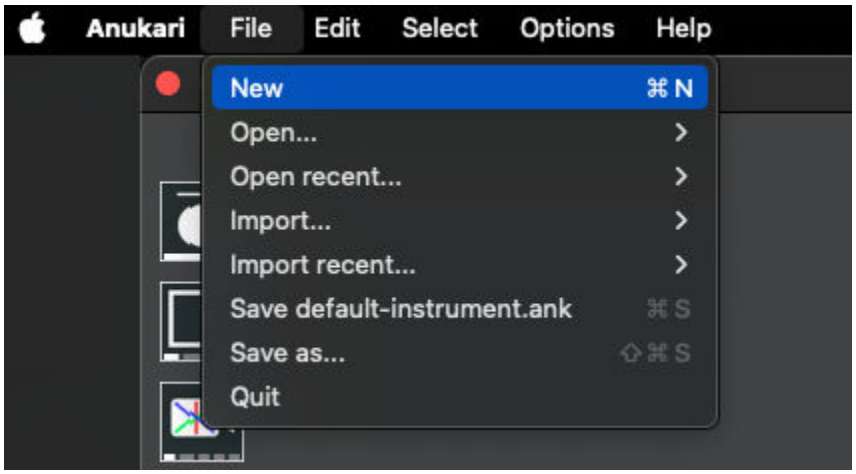


If the user chooses to continue without saving, then a file selection window will open where a new preset can be selected for loading.



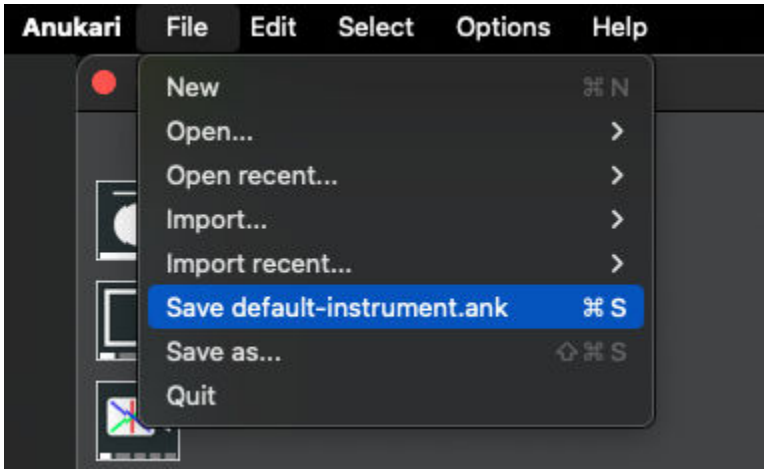
Presets can also be quickly loaded and switched via the Preset Selector. There are dropdown menus from which to choose different collections (factory, user, etc.), categories, and preset files to load. The “<” and “>” buttons (previous and next) will instantly cycle through the preset files within the selected category.

Creating a new preset

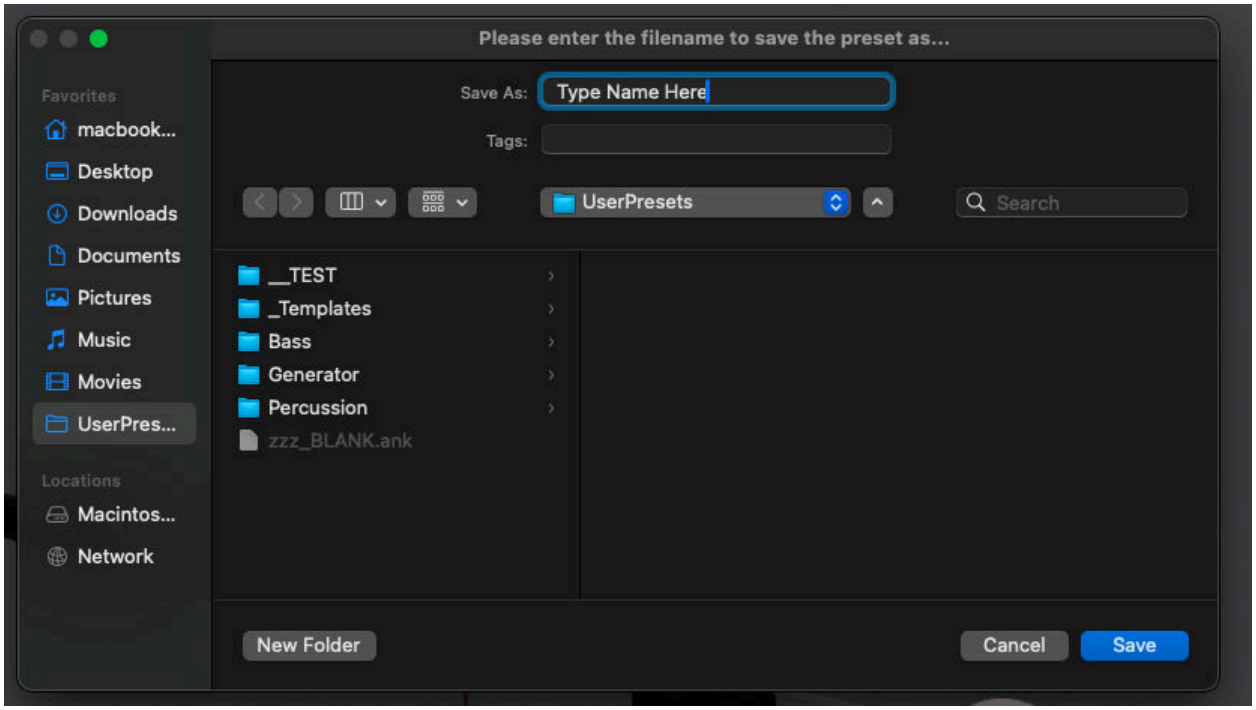


To create a new preset, start by clicking “File” on the menu bar and selecting “New.” This will load a preset called “default-instrument.ank.” From here, you may edit the Objects and their settings, add new Objects, or make any other changes you wish.

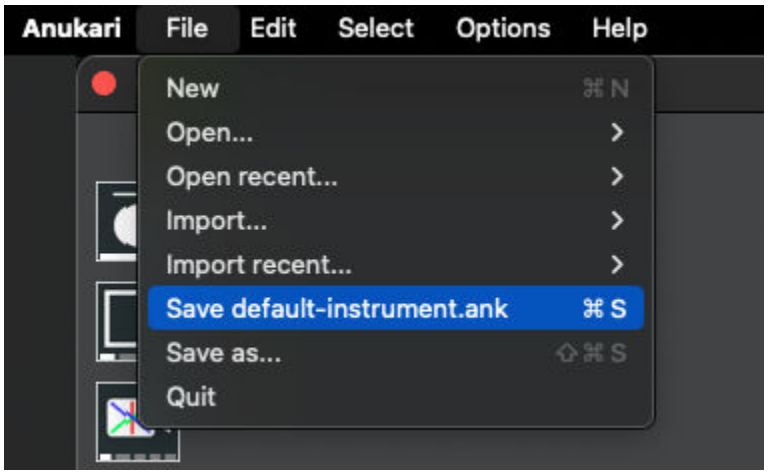
Saving a preset



To save a preset, click “File” on the menu bar and select “Save as...”



This will open a file saving window where a filename can be created.

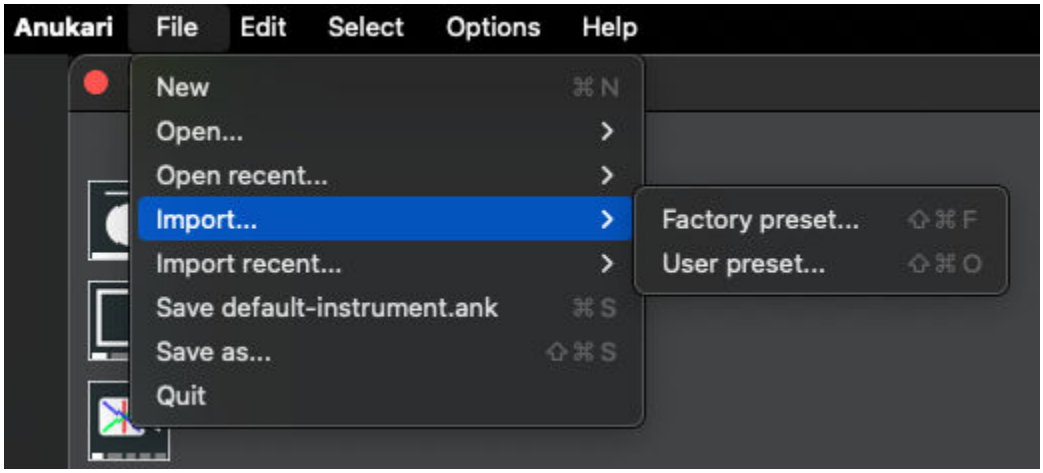


If the preset already exists and the user is saving changes to the preset, then the “Save [name of preset file].ank” option will appear. Clicking on this option will save the current changes to that same preset file.

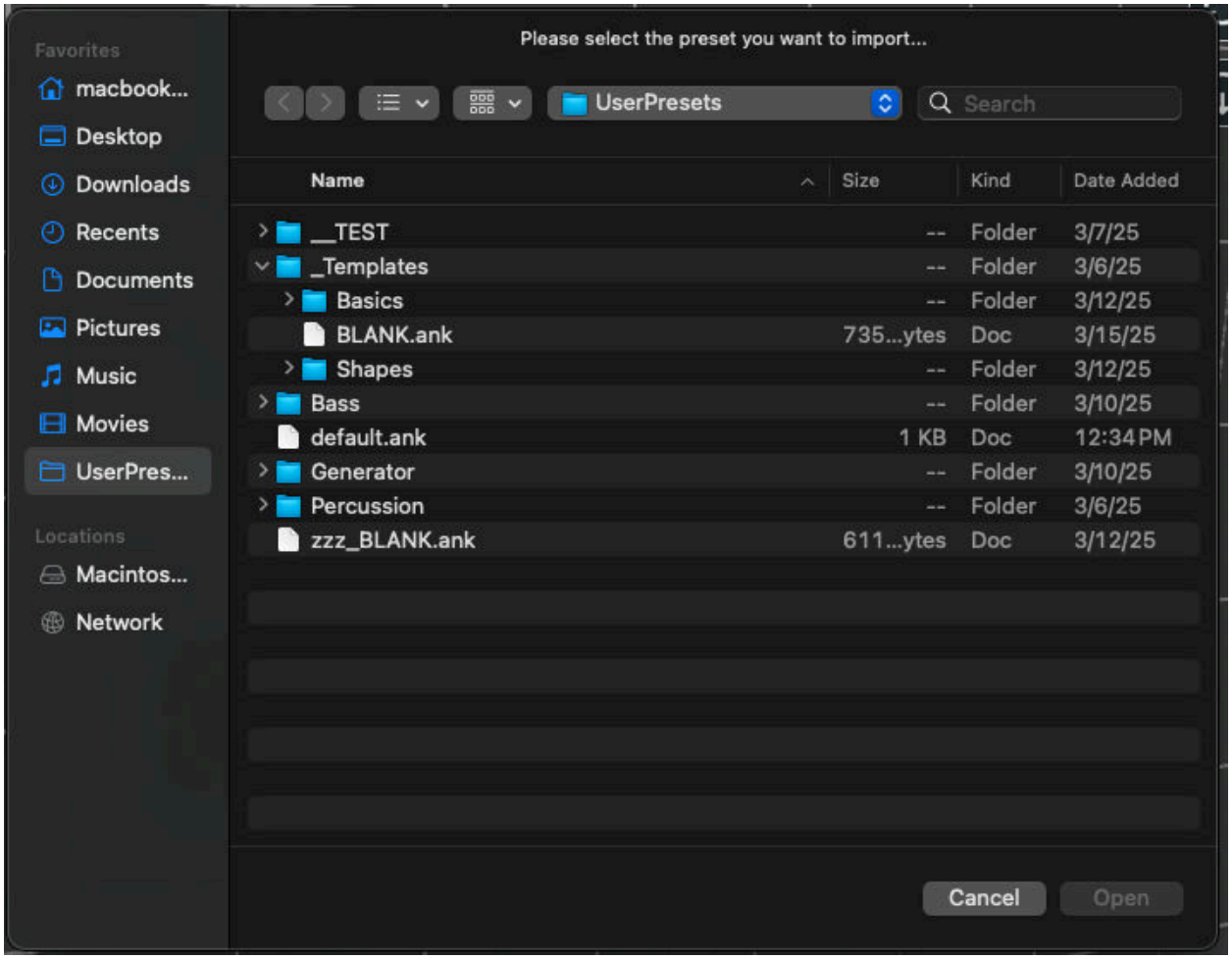
Note: The “default-instrument.ank” file is a system preset that cannot be saved/overwritten, so selecting either “Save default-instrument.ank” or “Save as...” will open a file saving window where a new filename can be created.

If the user attempts to quit Anukari without saving the current preset, then a prompt will appear asking if the user wants to continue. Clicking “Exit without saving” will close Anukari, and any unsaved preset changes will be lost. Clicking “Don’t exit” will return the user to the main Anukari window.

Importing an existing preset



Anukari allows users to add Objects and settings from one preset to another by importing preset files. To do this, click “File” on the menu bar, select “Import...” and then choose either “Factory Presets...” or “User Presets...” Factory presets are included with Anukari, while user presets are created or added by the user.



Once either “Factory Presets...” or “User Presets...” is selected, a file selection window will open and allow the user to choose which preset file they wish to import.

Objects from the imported preset file will be added to the current preset, which the user may then adjust or reconfigure as needed.

Saving a preset file from here will include all Objects and settings that are present in the current preset.

10. Help & Resources

Jumping into such a unique tool as Anukari can come with a learning curve, so we've provided multiple resources to help guide the user.

The Anukari app itself includes informational video clips for all its major features, which can be accessed by clicking "Help" on the main menu bar and then selecting "View Tutorials."

Other resources are available through the official Anukari YouTube Channel and Anukari.com. New updates, additional information, and demos are added regularly. Check out the links below for the most up-to-date information and to sign up for notifications.

Online Resources

Official website: anukari.com

YouTube Channel: youtube.com/@anukarimusic

Discord: discord.gg/9c6GmgKp

X.com: x.com/anukarimusic

Thank You!

We want to thank you again for adding Anukari to your audio toolset. Creating Anukari has been a true labor of love—the work of a single programmer bringing his passion project to life. We're beyond thrilled to see this crazy concept realized, and even more excited to see how you will use Anukari to create your own never-before-imagined audio.

But our work's not over. We will always be iterating on Anukari to deliver unique new features and even better performance to our users, so stay tuned.