**Quanta User's Guide**
Audio Damage, Inc.
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# Granular Synthesis: A Brief Introduction

First proposed by the 20th-century composer Iannis Xenakis, granular synthesis considers sound—any sound—to be made up of a large number of short, simple sounds, called *grains*. By combining a sufficient number of grains with varying characteristics, such as pitch, timbre, loudness, and spatial position, sounds of any timbre and complexity can be created.

In addition to synthesizing sounds from scratch, granular-synthesis techniques can be used to deconstruct an existing recorded sound and reconstruct it with a change in some characteristic such as pitch or timing, or to alter it beyond recognition. Imagine listening to an isolated, short fragment of a sound, only a hundredth of a second long or less. That single fragment probably wouldn't contain enough information for you to recognize it as part of the original sound. However, if you were to play many of these fragments of sound in rapid succession, each one taken from a little further along in the original sound, you'd reproduce the original sound.

Here's where the magic comes in: suppose you choose the starting location of each grain such that the grains overlap by half. You'd hear the original sound (or something close), but it would last half as long as the original. Or, instead, play each grain twice: the result would be a stretched version of the original, lasting twice as long. Play a few grains repeatedly, and you'd hear a little snippet of the sound frozen in time. Then suppose you could manipulate the pitch of the grains and combine this with how fast you move through the original sound as you play the grains. You could change pitch without changing the duration of the sound or do something like playing the sound transposed up an octave but lasting three times as long as the original. There's also no reason you must play through the original recording in a linear fashion. You could go back and forth or jump around at random.

That's the theoretical view. The practical reality of granular synthesis is that describing all the necessary changes in characteristics of a large number of grains, and then somehow creating and arranging all of these little bits of sound, exceeded the capabilities of audio technology that Xenakis had at his disposal. He conducted granular-synthesis experiments by cutting up and splicing magnetic audio tape. Eventually computers could synthesize sounds digitally, but not in real time: the synthesis parameters were described with text files, which were interpreted by the computer which eventually produced the sound as a static recording. (It was a little bit like painting by writing out a list of instructions telling which colors you wanted where on the canvas, giving that list to someone else, waiting while they put the paint on the canvas for you, and then looking at the result. If you didn't like the results, you revised the list and handed it back to the painter.) Decades later, computers are much faster and real-time granular synthesis is entirely viable. However, the problem of how to describe the evolution of the characteristics of the grains remains.

Quanta solves this dilemma by presenting a granular synthesis engine in the form of a classic subtractive synth, with oscillators, filters, envelope generators, low-frequency oscillators, and a routing system to tie it all together. All the control parameters for grains are presented with knobs and other screen controls. LFOs, envelope generators, MIDI controllers, and your DAW's parameter automation let you manipulate sound in ways not possible with either a standard sampler or synthesizer. With an MPE controller, you can push, pull, and bend sounds as you play. Quanta harnesses the power and flexibility of granular synthesis, turning it into an eminently playable instrument.

## System Requirements

The following table summarizes the operating system requirements and provided formats for Quanta:

| Operating System | Minimum Version | Formats |
|---|---|---|
| macOS | 10.11 | AudioUnit, VST3 and AAX, 64-bit; Intel and Apple M1 |
| Windows | 8.1 x64 | VST3 and AAX, 64-bit |
| Ubuntu | 18 x64 | VST3, 64-bit |

To use Quanta, you'll need a 64-bt host application such as Ableton Live, Bitwig Studio, Apple Logic, Avid ProTools, etc[1]. We assume that you are familiar with using plugins with your host. If you have general questions about installing and using plugins with your host, please refer to its documentation.

## Installation

To install Quanta, double-click the Quanta Installer icon, and follow the instructions. You can choose which plugin formats to install and, for some formats, the plugin destination folder.

## Demonstration Version

We encourage you to download and try the demonstration version of Quanta before purchasing it. The demo version of Quanta is the same as the regular version, but has the following limitations:

- Presets cannot be saved, nor can parameter values or other settings. This includes the information usually stored by your host DAW. If you save a DAW session with an instance of the demo version of Quanta, Quanta will revert to its default state when you reload the session.
- Quanta will cease to generate audio at all 20 minutes after you add it to your DAW session. You can remove it and add it again, but it will revert to its default state.

[1] Product names and plugin format names are copyrighted by their respective owners.

# New in Version 2.0

Version 2.0 delivers a number of improvements in Quanta's appearance, operation, and sound generation. If you're familiar with version 1, here are the differences you'll observe:

- An overhaul of the user interface: a fresh coat of paint, some tidying up and rearranging to both accommodate new features and controls while improving usability.
- A reworked modulation interface: gone is the somewhat vexing modulation matrix; no more scrolling past empty rows. Instead, right-click on almost any control to add and adjust modulation sources and amounts.
- Modulation indicators: knobs for modulated parameters display an animated arc indicating the current modulation amount.
- Root note detection and adjustment: Upon loading a sample, Quanta detects the root note of the sample. Sample transposition happens automatically without adjusting the granulator's tuning. If you're not happy with the automatic detection result, you can override it manually.
- Grain-pitch quantization: optionally, the granulator generates pitches only present within a user-defined set of notes. The frequencies observe the current tuning system, either MTS-ESP or TUN file if active or standard 12-tone equal temperament if not. Yes, you can now do strange and wonderful things with granular synthesis and yet stay in tune with your music.
- A second virtual-analog oscillator, identical to the one found in version 1. Two oscillators are more than twice as much fun as one.
- Built-in effects: Drawing from our extensive experience with effects processors, we've added delay, chorus, and reverb to Quanta.
- New LFO features: amplitude control, switchable bipolar output, and a sync switch which causes FLFO 2 to reset whenever FLFO 1 restarts.
- New EG features: time- and amplitude-scaling knobs provide fast adjustment of the overall envelope shape.
- More MIDI control: Four new macro knobs provide manual, automatable modulation sources. These knobs can be mapped to MIDI Continuous Controller messages for direct manipulation from your keyboard or other controller.
- The global controls for unison mode, voice count, and output level are now always present at the top of Quanta's window.
- The preset manager now displays four columns, giving you another folder layer to organize your presets. Also, double-clicking a preset's name loads it and dismisses the preset manager without further ado.

## Version 1 Compatibility

From your DAW's perspective, version 2 of Quanta is a completely different plugin than version 1. You can use both in a DAW session side by side, although we think you'll want to migrate to version 2 right away. Version 2 can load presets created with version 1, but not vice-versa: presets created by version 2 *cannot* be loaded by version 1.

# Quanta Overview

Before we dive into the details, we'll describe Quanta's overall architecture and introduce a few terms.

## Signal Flow

Quanta's signal flow is pretty simple. Quanta can load a single sample file from which the grain-synthesis engine (hereafter referred to as the *granular oscillator* or *granulator*) generates grains. The signals from the granulator, two virtual-analog oscillators, and a noise source are added together and fed into a pair of filters. The output of the filters passes through chorus, delay and reverb effects before emerging from the plugin. The virtual-analog oscillators and/or noise source can also be fed into the granulator, and the filters can be arranged in series or in parallel.

## Polyphony

Quanta is fully polyphonic, which is to say that it can play several notes simultaneously. The sound for each note is created by what we call a *voice*. The voices have a common set of controls and parameters, shown by Quanta's window. As you'd expect, turning one of Quanta's knobs changes that setting for all the voices. Quanta has 15 voices, and hence can play up to 15 notes simultaneously. Quanta also has a unison mode which causes some or all of the voices to play the same note, creating a thicker sound.

## User Interface

Quanta uses knobs for most of its controls. Click and drag either vertically or horizontally to manipulate the knobs. Double-clicking a knob will return it to its default value, which will usually be the parameter's most neutral setting. Hold down the CTRL or Command key while clicking and dragging to adjust a knob by small amounts.

Quanta's user interface is presented in one resizable window. The upper half of the window displays one of four panels or views. The views are selected by clicking the labels at the top, and are as follows: Waveform, Envelopes, Modulation, and Settings. The lower half of Quanta's window displays one of three views, also selected by clicking the labels: Oscillators, Filters, and Effects. We'll describe each of these panels in detail, although we're going to skip around a bit rather than covering them in the order in which they appear.

# Waveform

The Waveform panel displays the sample loaded into the granulator. You can load files by clicking the anachronistic icon[2] in the lower left, or by simply dragging a file onto Quanta's window. Loading another file replaces any previously loaded file. You can remove the sample from Quanta (without deleting the file itself) by clicking the icon with the X in it. The name of the sample file appears near the bottom left.

The curvy red line depicts the sample data in the usual manner: time runs from left to right, and higher peaks indicate louder parts of the sound. A vertical line indicates the position within the file from which grains will be sampled; you can change this position by clicking in the view, or by twiddling the **POSITION** knob in the **GRANULAR OSC** section (more about this section later).

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[2] If you don't recognize this icon, ask someone over 40.


Quanta will load files in the following formats: WAV, AIFF, MP3, Ogg, and FLAC. It should accept files of any sampling rate and bit depth. If the file has more than two channels, only the first two will be loaded. If the file's sampling rate does not match your DAW's sampling rate, the file will be resampled at your DAW's rate to eliminate unwanted pitch shifts. Also, the sample is normalized upon loading; that is, its volume is adjusted to maximize its loudness.

Once you load a sample file into Quanta, its audio data is stored within the data that your host DAW retains for Quanta. It is also saved within preset files. Hence those preset files can be moved to a different computer without requiring you to also copy the original sample files. Note that loading a large sample file takes a little bit of time which you may notice while loading a session or preset in your DAW.

## Pitch Measurement

When Quanta loads a sample, it attempts to measure its root note or frequency. It measures the frequency at four equally spaced positions within the sample and chooses what it thinks is its best measurement out of the four. The results may be good or bad, depending on the nature of the sampled sound. If the sound is relatively simple and stable in pitch, Quanta's measurement will probably be exact. If the sound is complex—like a drum loop, for example—Quanta probably won't guess its pitch correctly and will assign it a default value of C4 (middle C). If you aren't happy with Quanta's measurement you can click and drag on the ROOT NOTE box below the sample display. When you play notes above the root note setting, Quanta transposes the sample upwards; playing notes below the root note transposes downwards.

# Oscillators

The Oscillators panel houses the controls for things which make sound: the granular oscillator, two virtual-analog oscillators, and a noise source.

## Granular Oscillator

The section labeled **GRANULAR OSC** contains the controls for the granulator.


The **GRAINS** knob controls the rate at which new grains are generated, that is, it sets the number of new grains created per second. It has a range of one to 100 grains per second.

The duration of each grain is governed by the **LENGTH** knob. The length is expressed in milliseconds (thousands of a second) and ranges from 1 millisecond to one second. Traditionally, granular synthesis uses grain durations of 100msec or less, but we extended the available duration out to one second so that Quanta can create glitchy delay-like effects.

Note that the number of grains you'll hear at one time depends on the settings of both the **GRAINS** and the **LENGTH**. For example, if **LENGTH** is 100msec (a tenth of a second) and **GRAINS** is 5, you'll hear only one grain at a time because the interval between grains is 1/5 of a second, or 200msec. If you listen while turning the **LENGTH** up to 200, you'll hear the grains lengthen and eventually overlap and blend together.

You can think of the **ENVELOPE** control as applying a volume envelope to each grain, or as creating a fade-in and fade-out at the beginning and ending of each grain. The setting of this control affects the resulting loudness contour of the grain. Change it by clicking and dragging vertically. The graphic inside the control illustrates the loudness shape, but we'll list them here for completeness:

Rectangle - no shaping at all, just instant on, instant off, with full signal amplitude. Yes, this will almost certainly create clicks in the resulting audio. Sometimes clicks are what you want.

Triangle - a linear ramp from zero to maximum, followed immediately by a linear ramp back to zero. This creates smooth grains without clicks, but with a somewhat attenuated level. This shape can be useful if you're using many grains at once.

Trapezoid - like a rectangle, but with short linear ramps at the ends. This shape is a compromise between the full-signal level of a rectangular envelope and the smoothness of a triangular envelope.

Sine Squared - created by multiplying the mathematical sine function by itself, this is like a triangle with the corners rounded off. It is click-free and has a slightly higher signal level than the triangle envelope.

Half Sine - another shape based on the sine function, this produces a rounded envelope with a higher average level that then sine squared shape.

Rounded Rectangle - a rectangle with its corners rounded off, i.e. a slightly smoother version of the trapezoid shape.

Curved Up, Curved Down, Ramp Up, Ramp Down - these shapes, unlike the preceding ones, are asymmetric. The Curved Up and Ramp Up shapes start at zero, reach maximum amplitude at the end of the grain, and then fall to zero. The Curved Down and Ramp Down do the opposite: they jump from zero to maximum at the beginning of the grain, then fade to zero. The Ramp shapes move in a linear manner, while the curved shapes have an exponential curve.

Traditionally, granular synthesis uses symmetric grain shapes since the intent is to make the grains blend seamlessly, creating a cohesive sound. If you're interested in a more pointillistic result, the Curved Down and Ramp Down shapes provide percussive or plucked-sounding grains. On the other hand, the Curved Up and Ramp up shapes, particularly when applied to grains with a long duration, can create the impression of a sound being played backwards, even though the sample is played forwards.

The length and shape of the grains can affect the very beginning, or attack, of the overall sound. Consider, for instance, a grain with a length of one second and a triangular shape. Regardless of whatever the source sample contains, the attack of any notes will be a half-second ramp, that is, the first half of a one-second triangular envelope.

The **DIRECTION** popup menu chooses the direction that samples are read as the grain plays; that is, it determines whether the grain plays forwards or backwards, relative to the sample file. There are several choices, as follows:

**FORWARD, REVERSE** - these do what you'd expect: the grain plays samples forwards or backwards.

**PLAY DIR** - in this mode, Quanta watches for changes in the grain source position—that is, modulation of the Grain Position value—and notes whether it is moving forward, towards the end of the sample file; or backward, towards the beginning of the file. It then plays the grain in the same perceived direction.

**-PLAY DIR** - this is the same as the PLAY DIR mode, but the grain plays in the direction opposite the direction of the motion of the grain position.

**RANDOM** - the direction of the grain is chosen randomly.

The **POSITION** control sets the location within the sample file at which grains start playing. Grains play from this point forwards. You can also set this location by clicking and/or dragging within the Sample view; the dimmed orange dots indicate the position. However, if the grain plays in reverse, it does not start at this location. Instead, it starts later in the file, by the duration of the grain, and plays backwards towards the location set by **POSITION**. In other words, grains always play the same chunk of the file regardless of whether they're playing forwards or backwards.

When you play a note, an orange oval appears in the sample display at the source location. This may be somewhere other than the dimmed orange dots if the granulator's source position is modulated. The oval is animated, i.e., it will move to indicate any modulation, showing you where the granulator is reading samples. If the source position is randomized, either with the **POSITION RAND** knob or the corresponding modulation destination, the width of the oval shows the range over which samples will be read randomly. The number beneath the **POSITION** knob expresses the position as a number in the range 0-1; e.g., 0.5 means the midpoint of the sample file.

The **TUNE** knob adjusts how fast the grains play samples from the sample file, which usually changes their perceived pitch. Turning the knob clockwise from its center position makes the grains play faster, raising the pitch; turning it anti-clockwise makes the grains play slower, lowering the pitch. The value of this knob is expressed in cents, from -2400 to +2400, providing a four-octave range.

If you want the granulator to respond in the usual manner to MIDI notes—that is, playing up the keyboard makes Quanta play successively higher notes—set the modulation routing of **NOTE** to **TUNE** to 100. This provides a standard scaling of one semitone per MIDI note. The **NOTE** modulation signal is relative to the **ROOT NOTE** setting; playing notes above the root note raises the grain pitches, playing notes below the root note lower the pitches. This modulation is provided by default in a new instance of Quanta.

Note that the perceived pitch of the granulator depends on several things, including the **TUNE** and **ROOT NOTE** controls. The apparent pitch of the source sample itself, the grain length, and changes in the grain source position can all influence the apparent pitch.

The **FINE** knob does the same thing as the **TUNE** knob but has a smaller range to allow more precise adjustments in pitch, and/or more subtle modulation. It has a range of -100 to +100 cents, or two semitones.

Clicking the little keyboard button to the right of the **TUNE** knob invokes a small window for setting pitch quantization options for the granulator. If the button to the left is off, the granulator operates normally, and grains can take on any pitch. If the button is on, grain pitches are constrained, or quantized, to musical notes. The collection of buttons to the right, representing a piano keyboard, controls which musical notes are used. If all of the buttons are on, grain pitches will be any of the 12 notes in an octave. If only the buttons in the lower row are on, for instance, all grains will play only the natural notes and no sharps or flats. Turn the buttons on and off to match the key and scale of your music. Note that this pitch-restriction mechanism uses the current tuning system (see the [Global Tuning] section) to choose its frequencies. Finally, click anywhere outside of the small window to dismiss it.


The **LEVEL** knob simply adjusts the granulator's output level before it is sent to the filters. You may need to turn this knob down from its maximum setting if you're using a high grain density and you hear undesired distortion.

The vertical sliders labeled **INPUT LEVELS** route audio signals from the oscillators, noise source, and the sample into the granulator. These signals are added together, and the combined signal is chopped up into grains. Thus, Quanta's granulator can generate sound even without a sample file. Judicious adjustment of the **GRANULAR OSC** controls will turn the simple waves from the oscillators into a thick, "super-saw" layer of sounds. Applying granular synthesis techniques to noise generally just produces more noise, but you might find that a little bit of noise is useful for adding a subtle thickening to a sample file, or for synthesizing percussive sounds.

The **WIDTH** knob adjusts the apparent stereo width of Quanta's output. Quanta's granulator is a "true stereo" processor: there are actually two granulators, one for each output channel, with a common set of controls. If your source sample has two channels, each channel will be processed independently by one of the granulators. If your source file has only one channel, both granulators will still run, each reading from the file. The two granulators generally produce decorrelated signals—that is, signals without much information in common—particularly if one or more of the grain parameters are randomized or modulated. This produces a wide stereo image from even a mono file. However, sometimes that image can be a bit too wide since it will span your entire mix. The **WIDTH** knob provides an adjustable amount of cross-mixing between the channels, which reduces the apparent stereo width. A setting of zero percent produces a mono output; turning the knob up widens the output signal, all the way up to its maximum possible channel separation.

### RAND Knobs

Many of the granular oscillator controls have an associated knob labeled RAND. These knobs introduce random fluctuations of the parameter; the more you turn up the RAND knob, the more randomization you get. Even a small amount of randomization of any one of the parameters will create slight differences between one grain and the next, resulting in a much more animated and interesting sound. Turning any of the RAND knobs all the way up usually ends in chaos, so the happy medium probably lies somewhere in between zero and maximum—unless, of course, chaos is your goal.

## VA Oscillators

In addition to the granulator, Quanta's main sound generator, there are two simple but versatile oscillators. These oscillators can be used to augment the granulator, for instance to provide a solid fundamental or a sub-octave tone. They can also be used independently of the granulator, effectively turning Quanta into a classic two-oscillator subtractive synth. Finally, the oscillators' signals can be injected into the granulator, whether or not there is a sample loaded. The grains create copies of the oscillator signals; with some modulation or randomization, combining these copies creates thick, "super-saw"-like timbres from one or both oscillators. Despite their secondary role, Quanta's oscillators feature sophisticated anti-aliasing, pulse-width modulation, and continuous waveform mixing to provide a very competent virtual-analog signal source.


Quanta's oscillators have five identical controls, as follows:

The **SHAPE** control both changes the oscillator's wave shape and displays it. Click and drag vertically to change the shape. The wave shape changes smoothly from a sinusoid to a rectangle to a ramp wave.

The **TUNE** knob changes the oscillator's basic pitch or tuning. Turn it clockwise to raise its pitch, anti-clockwise to lower it. Its value is shown in semitones and has a range of -24 to +24 (i.e. +/-2 octaves).

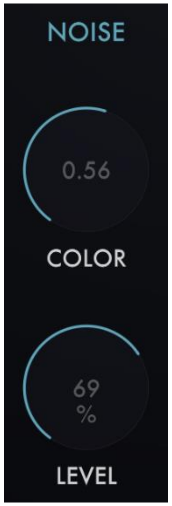
The **FINE** knob allows more precise adjustments to the oscillator's tuning than the **TUNE** knob. It has a range of +/-1 semitone, expressed in cents (one cent is a hundredth of a semitone).

The **PULSE WIDTH** knob varies the shape of the rectangular wave, which changes its tone. A setting of 50% produces a square wave. Other settings change the symmetry of the wave, making the high portion of its cycle shorter or longer than the low portion. Since most settings of the **SHAPE** knob blend the rectangular wave with either the sine wave or the ramp wave, the **PULSE WIDTH** knob almost always has at least some effect on the oscillator's timbre.

The **LEVEL** knob sets the level of the oscillator's signal that is sent to the filters. The **LEVEL** knob does **not** affect the signal sent to the granulator; the **OSC 1** and **OSC 2** sliders in the **GRANULAR OSC** section sets this level.

## Noise

Like the oscillators, Quanta's noise generator can be used directly and/or fed into the granulator. Use noise for synthesizing percussion instruments, sound effects, or to add a subtle thickening.




The noise generator has two knobs:

The **COLOR** knob essentially changes the sampling rate of the noise generator, which in turn changes its tone or timbre. At its maximum setting, the noise generator produces a nearly uniform spectrum, i.e., white noise. Turning the knob anti-clockwise makes the noise darker and grittier.

The **LEVEL** knob sets the level of the noise generator's signal that is sent to the filters. The **LEVEL** knob does **not** affect the signal sent to the granulator; the **NOISE** slider in the **GRANULAR OSC** section sets this level.

# Filters

Each of Quanta's voices has two filters. Each filter can operate in one of eight configurations or be turned off altogether. The filters can be arranged in series, so that the signal first passes through filter one and then through filter two; or in parallel, so that the signal passes through both filters and their outputs are added together.


Like most filters found in synthesizers and elsewhere, Quanta's filters have two main controls: frequency and resonance (abbreviated **FREQ** and **RES** in the window). The frequency knob changes where, in the range of audible sound frequencies, the filter takes effect. Changing the frequency setting makes the sound brighter or darker, or fuller or thinner, depending on the filter's type or shape.

The resonance control, when turned up, causes the filter to emphasize frequencies near its frequency setting. In plainer terms, if you turn up the resonance knob, the filter sounds more "synthy". (Try it—you'll hear what we mean.)

Each filter has a set of controls and a graphic representation of its frequency response. In addition to moving the **FREQ** and **RES** knobs, you can click and drag in the graphic display to change the frequency and resonance of the filter simultaneously.

The icons below the graphic display choose the configurations. There are four frequency-response modes and two steepness settings, for a total of eight response characteristics. Click the icons to change the mode. The modes are, from left to right:

OFF - the signal passes through the filter unaltered.

LOW PASS - high frequencies are attenuated while low frequencies pass through.

BAND PASS - a range of frequencies pass through while higher and lower frequencies are attenuated. The resonance setting adjusts the width of the range; a higher resonance narrows the range.

HIGH PASS - low frequencies are attenuated while high frequencies pass through.

NOTCH or BAND REJECT - high and low frequencies pass through while a range of frequencies in the middle are attenuated. The resonance setting adjusts the width of the range; a higher resonance narrows the range.

The buttons labeled **4 POLES** and **2 POLES** select the slope or steepness of the filter. The four-pole response is steeper than the two-pole and reduces filtered frequencies more intensely.

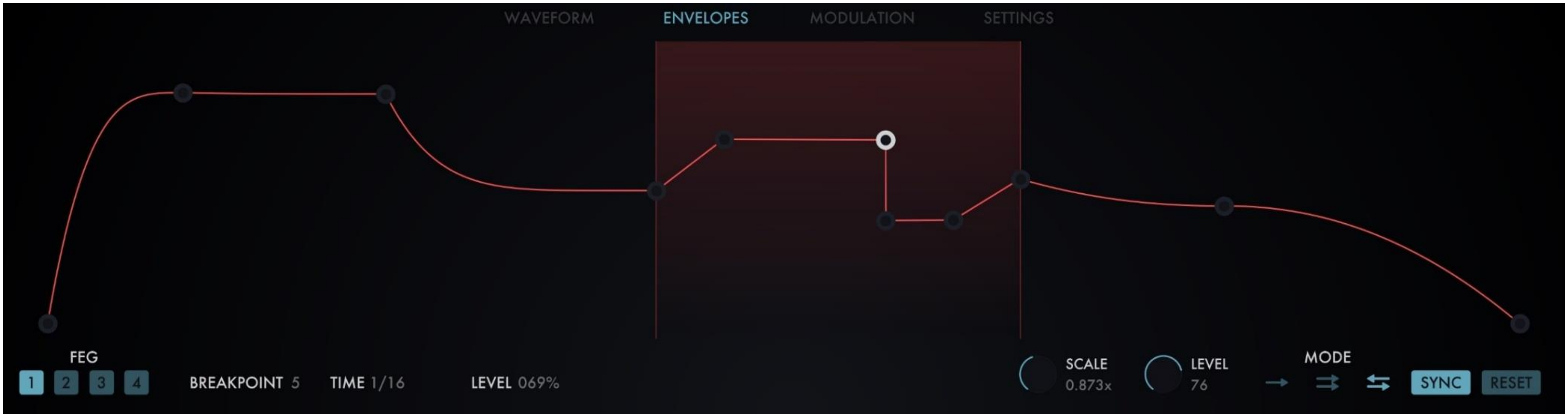
Finally, the buttons labeled **SERIAL** and **PARALLEL** at the at the center change the filters between the serial routing and parallel routing. Filter two follows filter one when they are connected in series.

There are a couple of subtleties inherent in this routing system. First, it's entirely possible to configure the filters such that nothing passes through them at all, silencing Quanta altogether. For example, consider the arrangement below. If the routing mode is serial, you won't hear anything because the signal from the oscillator and/or granulator will enter only filter one. Filter one will attenuate all of the high frequencies, passing only low frequencies on to filter two. Filter two attenuates the low frequencies, and then there's nothing left to hear. However, if you switch the routing mode to parallel, both filters receive the signal from the oscillator and/or granulator. The low frequencies from filter one's output will be added to the high frequencies from filter two, and you'll hear highs and lows but nothing in the middle.


Second, when a filter is turned off, it passes the signal unaltered. If the filters are routed in series, turning off a filter does what you'd expect: that filter has no effect on the signal. However, when the filters are in parallel, the unaltered signal emerging from the inactive filter is added to the signal from the other filter. This can be a bit perplexing at first, since it creates configurations that aren't possible with a single filter. For instance, suppose you put a lowpass filter in parallel with a filter that's turned off. You'll still hear the high frequencies of the original signal since they'll pass through the off filter and be added to the output of the lowpass filter, boosting the low frequencies. As another example, a bandpass filter in parallel with an off filter will give you a sort of peaking EQ, where all frequencies are present in the output with a boost in the middle of the spectrum created by adding the signal from the bandpass filter.

# Envelopes

The Envelopes view presents Quanta's four envelope generators, displayed one at a time. The four envelope generators have identical features and controls but operate independently. Click the numbered boxes at the lower left to switch between the four.




Unlike the standard ADSR-style envelope generators found in many synthesizers, Quanta's Flexible Envelope Generators (FEGs) can create modulation signals of almost any shape and description. Each FEG has an arbitrary number of *breakpoints*, that is, points with a specific level and a specific time relative to the previous breakpoint. When you play a note, the FEGs start at the first breakpoint, which always has a level of zero, and move from one breakpoint to the next. The last breakpoint also always has a level of zero. You can add any number of breakpoints between the first and last. A single breakpoint produces a simple attack/release envelope; adding two breakpoints emulates an ADSR (one point for the initial peak, another after it to define the sustain level).

The breakpoints are represented by the small circles joined by lines. We refer to the lines as *segments*. Click and drag a breakpoint vertically to adjust its level; drag it horizontally to adjust the duration of the segment, that is, the time between the breakpoint and the previous breakpoint. As you move a breakpoint, the breakpoint's level and the segment's duration appear below the FEG. Double-click a breakpoint to delete it. To add a new breakpoint, double-click on a segment. To change the curvature of a segment, click and drag vertically on or near the segment.

If you drag a breakpoint past the right edge of the window, the FEG's drawing will be rescaled so that it fits within the window. Conversely, if you make the envelope short enough, it will be expanded to fill the window. Note that the time scale is non-linear: a segment which appears twice as long as another segment will have an actual duration that's more than twice as long as the other. The actual duration is displayed at the bottom of the view. Segments have a maximum duration of ten seconds.

The FEGs can also be synchronized to the host DAW's tempo and transport; click the **SYNC** button on the right to activate this synchronization. When sync is on, the segment durations are expressed in multiples of 1/32nd of a beat and can be as long as a full measure. Note that when sync is on, the time scale within Quanta's window is linear.

The FEGs can loop over any number of adjacent breakpoints while the note sustains. A pair of vertical lines and a shaded rectangle indicate the start and end points of the loop. Move the loop points by clicking either of the vertical lines and dragging them horizontally. If you set the start and end points to the same breakpoint, the FEG will simply stay at that breakpoint while you hold the key down.

The FEGs have three different looping modes: one-shot (i.e., no looping), forward looping, and bidirectional looping. Click the arrow symbols near the lower-right corner of the FEG view to switch modes. The modes operate as follows:

One-shot: the FEG runs from start to finish, without looping or sustaining.

Forward: the FEG runs to the right-hand loop point, jumps back to the left-hand loop point, runs forward to the right, etc. until the note event ends. Upon note-off, the FEG runs from its current position to the end.

Bidirectional: same as Forward, except that the FEG runs backwards from the right-hand loop point to the left, rather than jumping, then forwards to the right, etc., looping back and forth until the note ends.

Note that the jump from the right-hand loop point back to the left will likely produce some sort of click or other discontinuity, depending on what the FEG is modulating. To avoid this click, you have two options: 1) set both loop points to the same level, so that the jump doesn't create a change in output level; 2) use the bidirectional looping mode—that's what it's there for.

The **SCALE** knob to the left of the Mode arrows adjusts the time scale or duration of all the segments in the envelope. Rotating this knob to the right from its center position will make all the segments longer; rotating it to the left will make them shorter. Thus, this knob makes the entire envelope run faster or slower without you having to adjust the breakpoints individually. The number to the right of the knob shows how much the times of the segments will be multiplied. The knob has a range of 1/8 to 8.

The **LEVEL** knob reduces the output level of the envelope signal. Rotating it to the left produces the same result as moving all the breakpoints downwards simultaneously.

The scale and level knobs are interesting modulation destinations. For example, you can apply a small amount of the **T-RAND** modulation source to the **LEVEL** knob so that the FEG's output varies by a small, random amount with each note. Or you could use a modulation depth of 100 with the Velocity source so that how hard you strike a key completely controls the FEG's output level. You could connect the Velocity mod source to the **SCALE** knob to make the FEG run faster when you hit notes harder, thus shortening the FEG's attack. Or you could connect it to the **MODWHEEL** source, allowing you to make a looping FEG run faster when you push your keyboard’s mod wheel forward.

Finally, clicking the **RESET** button at the right edge of the envelope display pane will reset the FEG to its default state which resembles a standard ADSR envelope generator. Use this button with caution; there is no undo command.

# Modulation

The Modulation panel contains controls and displays for Quanta's modulators, that is, things which generate signals that can influence parameters. In addition to the four envelope generators, Quanta has two low-frequency oscillators, a sample & hold module, and four knobs called Macros.

## Flexible Low-Frequency Oscillator (FLFO)


Quanta sports two low-frequency oscillators. Unlike simpler LFOs found in many synthesizers, the output of these oscillators varies smoothly through an almost endless number of shapes. Hence we call the Flexible Low-Frequency Oscillators, or FLFOs. The two FLFOs have identical features and controls but operate independently.

Four knobs control the shape and behavior of the FLFO's output. The effects of these three knobs are related, and it's far easier to understand what they do by seeing them in action than by reading a description. To that end, the wiggly red line in the **SHAPE** knob displays one cycle of the FLFO, reflecting the combined effects of the **SHAPE**, **PHASE**, **SKEW**, and **WARP** knobs. We'll describe each of these in turn, but you may find it just as illuminating to twiddle them and watch what happens as to read about them.

The **FREQ** (short for frequency) knob controls determine how fast the output of the FLFO varies over time. They operate either in units of frequency (Hertz, or cycles per second), or in metrical units (fractions of a measure). Click the **SYNC** button to switch between the two modes. The FLFO's rate can be set from one cycle every 10 seconds (or 0.1 cycles per second, abbreviated 0.01 Hz) to 10 cycles every second (10 Hz). When **SYNC** is turned on, the rate ranges from 2/1 (one cycle every two measures) to 1/32 (32 cycles per measure). A "D" or "T" after the number indicates dotted and triplet values.

The **PHASE** knob positions the FLFO's wave relative to either the start of the note, or to the host DAW's transport position. The setting of the **PHASE** knob corresponds to the left end of the wiggly red line. If **RETRIG** is turned on, the FLFO will start its cycle at this point on the wave when a note starts. If **SYNC** is turned on, the FLFO's cycle will align with the DAW's transport such that the cycle always starts at this point (at metrical intervals set by the **FREQ** knob). If neither **SYNC** nor **RETRIG** is turned on, the **PHASE** control isn't particularly relevant because the wave's alignment will vary from one note to the next, since it will cycle independently of the notes. Sometimes you want modulation that varies predictably with each note, sometimes you want modulation that evolves independently of the notes. The **RETRIG** switch lets you choose.

If you turn on the **LFO1 RST** switch, found at the bottom of FLFO 2's controls, FLFO 2 will reset to the beginning of its cycle every time FLFO 1 begins the start of its cycle. This is much the same as the sync switch found on pairs of oscillators in analog synthesizers, although in Quanta it syncs the sub-audio LFOs.

The shape of the FLFO's output is controlled with the **SHAPE, SKEW**, and **WARP** knobs. The **SHAPE** knob adjusts the basic shape of the signal, morphing it smoothly through four standard shapes: a double sine wave (a sine wave with twice the frequency set by the **RATE** knob), a sine wave, a triangle wave, and a square wave.

The **SKEW** knob adjusts the horizontal symmetry of the wave and has a different effect depending on the wave's initial shape. For example, if the **SHAPE** knob is set to produce a triangle wave, the **SKEW** knob varies the wave from a downward-sloping ramp to a rising ramp. If the **SHAPE** is set to a square wave, the **SKEW** knob varies the duty cycle of the wave.

The **WARP** knob applies an adjustable curvature to the wave, changing its vertical symmetry. It can bend a triangle wave into a sharp spike and change a sine wave into a rounded pulse.

Here's a quick walkthrough: start by double-clicking both **SKEW** and **WARP** to set them to their center (neutral) positions. Turn **SHAPE** all the way clockwise and you'll see a simple square wave. Turn **SHAPE** down slowly and you'll see the wave change into a triangle, then a sine, then a double sine. Set **SHAPE** back to 0.75 to get a triangle wave, then play with the **SKEW** and **WARP** knobs to explore their effect.

The **LEVEL** knob controls the amplitude or size of the FLFO's signal. Rotating it to the left lowers the amplitude of the FLFO, reducing its effect on all modulation destinations it reaches. If you turn it all the way anti-clockwise to zero, the FLFO won't have any effect on Quanta's sound.

The **BIPOLAR** switch below the **LEVEL** knob changes the range of the FLFO's output. When the switch is off, the FLFO's signal varies between zero and one. This means that, when connected as a modulator, it will only increase a parameter's value (or decrease it if the modulation depth slider is moved to the left). If the Bipolar switch is on, the signal varies between negative and positive one. The FLFO will then both increase and decrease the parameter's value.

## Sample and Hold

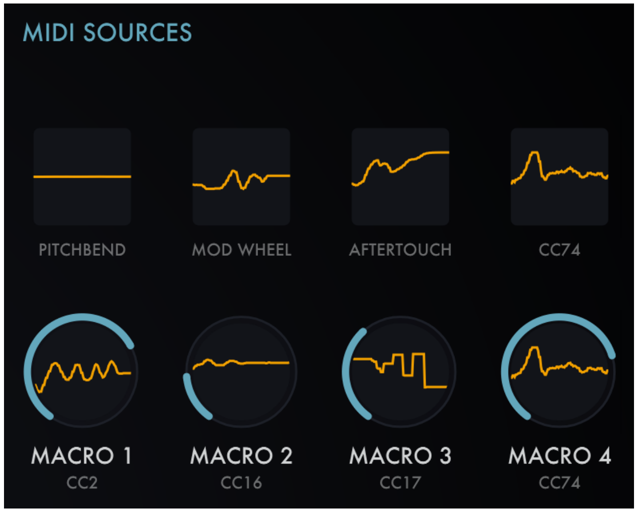

Also present in the Modulation panel, the Sample and Hold modulator (abbreviated **S&H**) reproduces a classic feature of analog synthesizers. It acts like a simple memory for modulation signals. When triggered, it samples its input signal, and holds that value at its output until it is triggered again. It's an old electronic sound-effects stereotype to feed a sample and hold module with a random signal (noise) and use its output to control the pitch of an oscillator, creating a series of random notes. Quanta's sample and hold, like the other modulators, can control any of the modulation targets—filter frequencies, grain position, whatever.

The **SOURCE** popup menu chooses the sample and hold's input signal, either a source of random numbers, or the outputs of any one of the four FEGs or two LFOs.

The **FREQ** (short for frequency) knob controls determine how often the sample and hold is triggered. It operates either in units of frequency (Hertz, or cycles per second), or in metrical units. Click the **SYNC** button to switch between the two modes. The trigger rate can be set from once every 10 seconds (or 0.1 cycles per second, abbreviated 0.01 Hz) to 10 times every second (10 Hz). When **SYNC** is turned on, the rate ranges from 2/1 (one trigger at the beginning of every two measures) to 1/32 (32 triggers per measure). A "D" or "T" after the number indicates dotted and triplet values. If the **RETRIG** button is turned on, the sample and hold triggers at the beginning of every note.

The **SMOOTH** knob applies an adjustable amount of smoothing to the sample and hold's output. If SMOOTH is set at zero, the output jumps from one value to the next. If you turn the knob all the way up, the output moves in a linear ramp between values. Intermediate settings provide a linear ramp followed by a flat spot until the next trigger.

## MIDI Sources and Macros




At the right side of the Modulation pane are displays for the signals from the dedicated MIDI Continuous Controller messages recognized by Quanta and a set of knobs we call *Macros*. The Macros are modulation sources whose values you set by moving the knobs. Since any modulation source can be received by more than one destination, you can use the Macros for things like controlling the cutoff frequencies of both filters simultaneously or making one LFO speed up while the other slows down. The Macros are also modulation destinations and thus can be influenced by other modulators[3].

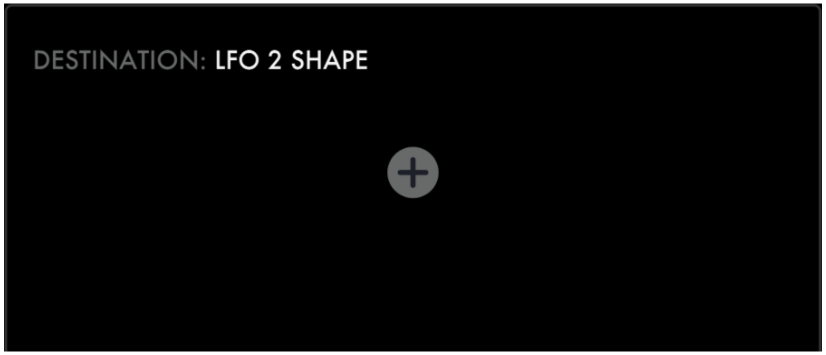
The Macros also respond to incoming MIDI Continuous Controller messages so that you can connect them to physical knobs or sliders without having to use your host's mapping features. Once you set up the assignments to your liking and save them with Quanta's other settings (see Write Settings below), they will be the same in any new instance of Quanta.

# Modulation Routing

We've talked about Quanta's modulation sources: the FEGs, FLFOs, and so on. By now you're probably wondering how to use these sources—how to connect them to other things, and what these things might be. In Quanta, almost all voice parameters are modulation destinations. If it has a knob on Quanta's window, you can connect a modulator to it. Many parameters of the effects can also be modulated, but with a restricted set of sources. Since the effects exist outside of the synthesizer's voices, the effects parameters cannot be modulated by the voice modulation sources such as the envelope generators and LFOs.

## Connections

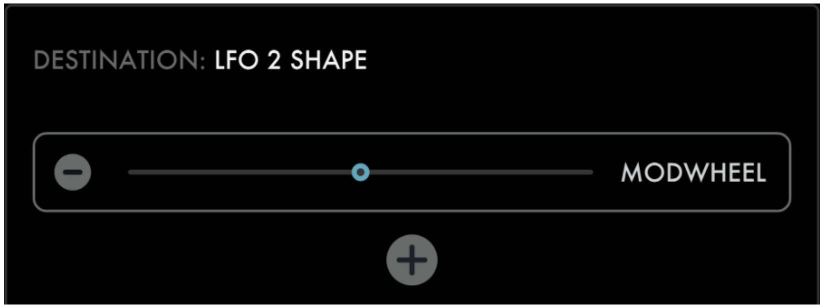
Instead of dangly simulated patch cords or a separate list of modulation routings, Quanta's modulation connections exist at every knob. Right-clicking a knob invokes a modulation routing pane, which looks like this:




[3] Yes, this does mean that you can create feedback loops within Quanta's modulation connections. We don't guarantee that the results will be predictable, or even stable. This path may be fraught with peril.

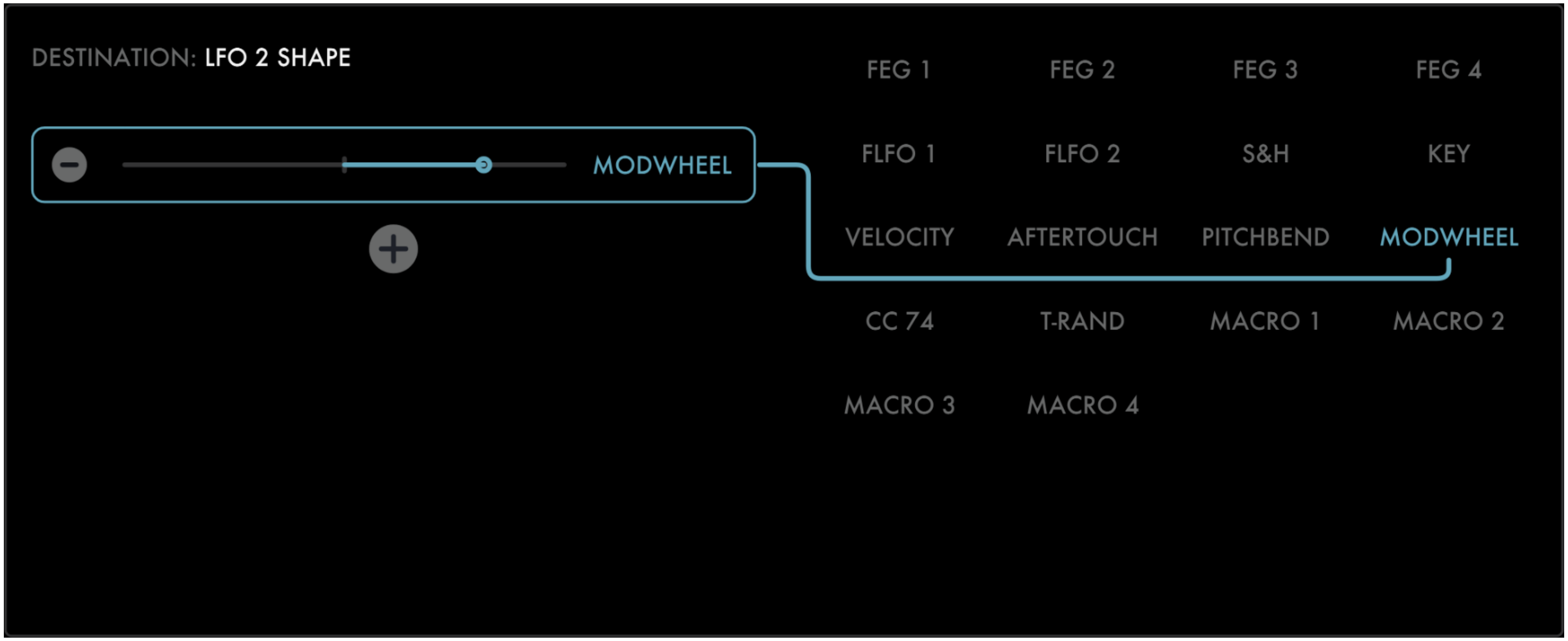
**DESTINATION** shows the name of the control you just clicked. To add a modulation connection, click the ⊕ symbol, which expands the pane to show the modulation sources:


Then click the name of one of the sources on the right. The pane collapses again, but now shows the source you chose and a slider:



Moving the slider to the right increases the amount that the modulation source affects the destination, i.e., the parameter. Moving the slider to the left from its center position has the same effect but inverts the modulation signal. If the slider is to the right of center, the modulation signal will have the same effect as rotating the destination knob clockwise. If it's to the left of center, it will have the same effect as rotating the knob anti-clockwise.

Modulation signals are added together for each destination; you can connect as many as five modulation sources to one (or more) destinations, with varying weights. To add additional modulation signals, click the ⊕ symbol again and proceed as previously described. To change an existing connection, first click on the name of the source, expanding the panel, then click a new source:




To delete a modulation connection altogether, click the ⊖ symbol to the left of the connection's slider.

Most modulation destinations are scaled such that if you set the connection to its maximum setting, the source can change the parameter across its entire range. So, for example, if you want an envelope generator to sweep the filter from its lowest frequency to its highest, turn the filter's frequency knob all the way anti-clockwise and set the connection gain of the FEG source to its maximum, as shown on the next page:


On the other hand, if you want an LFO to vary the filter cutoff just a little bit around a particular frequency, turn on the LFO's **BIPOLAR** switch, set the frequency knob to that value, and set the modulation connection gain slider a little bit right of center:


If you were to route the same LFO to the other filter's frequency knob and move the gain slider to the left of center, the filter frequencies will rise and fall at the same rate but in opposite directions.

Finally, click anywhere outside of the modulation panel to dismiss it.

## Sources

Most of the modulation sources—things that generate modulation signals—which appear in the routing pane should be self-explanatory. They correspond to the four FEGs, the two LFOs, and the Sample and Hold. The other sources are MIDI messages, as follows:

**KEY** - a modulation value representing the MIDI note number, i.e., which note you're playing on your keyboard. The **NOTE** modulation value is bipolar, that is, both positive and negative. The modulation value is centered on the value of the **ROOT NOTE** control found in the **WAVEFORM** panel. Playing up from the root note means the mod value increases above zero and playing down from the root note means the value decreases below zero. If you set the note mod value to +100 for both the **GRAIN TUNE** and **OSCILLATOR TUNE** destinations, Quanta will respond to MIDI notes as you'd expect. Also, the filters track this signal in the same manner as the oscillator and granulator: if you set the note mod value to

+100 for **FILTER 1 FREQ** and/or **FILTER 2 FREQ**, the filter(s) will track the keyboard also. If you're familiar with the half-tracking feature found on some synths, you can set the mod value to +50 to get the same result.

**VELOCITY** - this signal represents how hard you initially hit your keyboard, drum pad, whatever. Connect this signal to the filter frequencies to make notes sound brighter when you play harder.

**AFTERTOUCH** - this signal is generated by pressure on your keyboard as you hold down one or more notes.

**PITCHBEND** - the signal for the MIDI pitch-bend wheel. This signal is bipolar; pulling the wheel towards you generates negative values, so that you can bend note flat by connecting this mod source to **GRAIN TUNE** and/or **OSCILLATOR TUNE**. A modulation setting of 10 will give you a pitch bend range of two octaves, one octave in either direction.

**MODWHEEL** - the signal for MIDI Continuous Controller #1 messages. These messages are usually transmitted when you move the mod wheel on your keyboard.

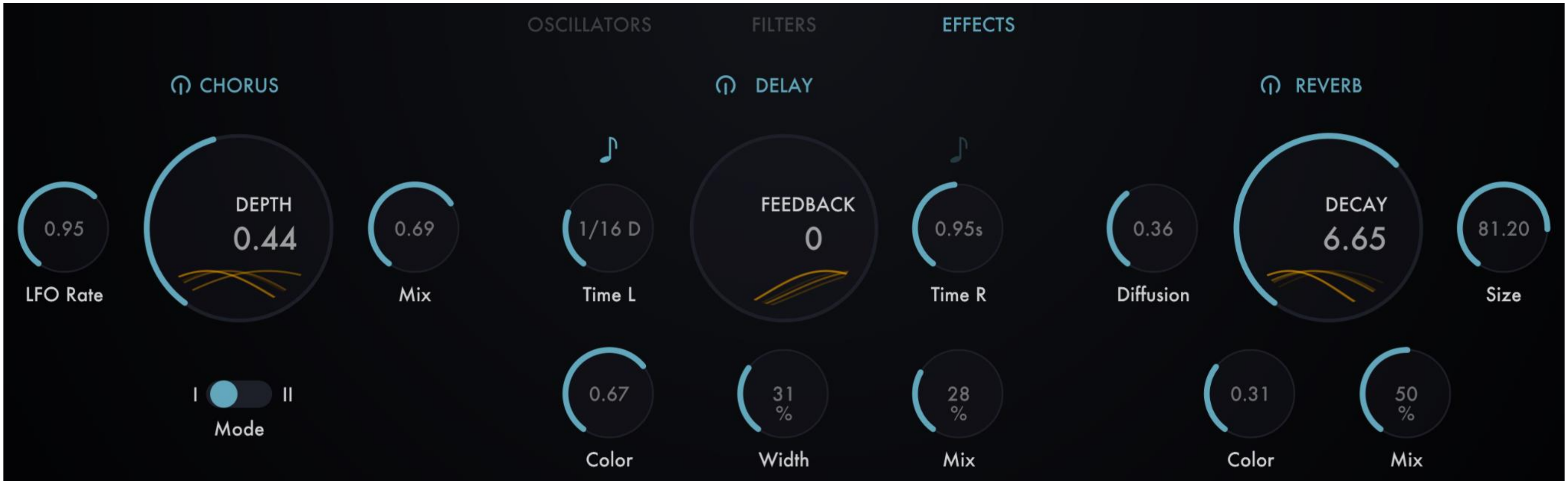
**CC 74** - the signal for MIDI Continuous Controller #74 messages. Originally these messages were somewhat hazily defined as "Brightness" in the MIDI specification, but now are commonly used by MPE controllers to transmit position information.

**T-RAND** - generated internally by Quanta, this is a triggered random signal. Its value is randomly generated every time a note-on event is received and is different for each voice.

**MACRO 1**-4 – the values from the four Macro controls, found on the Modulation pane. These values can be set either by moving the onscreen knobs or by assigning them to MIDI Continuous Controller messages.

# Effects

Every synthesizer sounds better with some added effects, so we've taken the liberty of adding a chorus, delay, and reverb processor to Quanta. These processors receive all of the synthesizer voices mixed together, that is, they're outside of, or after, the synthesizer itself. The signal passes through them in the order they appear in the window: chorus first, then delay, then reverb. Each effect can be switched on or off individually by clicking the power symbol to the left of the effect's name.




## Chorus

Chorus processors were among the first effects built directly into keyboard synthesizers, and with good reason: even a simple chorus can give a synthesizer a lusher, stereo sound. Our main sources of inspiration for Quanta's chorus were the effects found in Roland's early polyphonic analog synths. Our version consists of a pair of delays with independent modulation low-frequency oscillators.

The **RATE** knob changes the speed of the chorus's LFOs, controlling how fast the chorus shimmers or wobbles. The **DEPTH** knob controls how much the LFOs affect the delays. High settings of the **DEPTH** knob can produce audible pitch changes, which may or may not be useful. You may find that adjusting the **RATE** and **DEPTH** in complementary directions produces the best results, e.g. turning down the **DEPTH** after turning up the **RATE**.

The **MODE** switch selects one of two sets of operating conditions for the chorus. It changes the nominal delay times and ranges for the LFO rate and depth, producing two different flavors of chorusing.

The **MIX** knob sets the overall intensity of the chorusing by changing the blend between the unprocessed signal and the chorused signal. If you turn it down to zero you won't hear the chorus at all, while if you turn it up to 100%, you'll hear just the processed signal.

## Delay

Next in Quanta's effects chain is a stereo delay, with separate delay lines for each channel. Delays can be used for anything from short doubling effects to long, spacey echoes.

The **TIME L** and **TIME R** knobs set the delay times of the left and right delays, respectively. They have a range of one millisecond to two seconds. Turning on the corresponding **SYNC** switch makes the delay times operate in metrical units, expressed as fractions of a measure. The letters **D** and **T** indicate dotted and triplet values, so for example a setting of **1/8 D** means a dotted eighth note. If the **SYNC** switch is on the delay times will change to match the tempo of your host DAW.

The **FEEDBACK** knob sends some or all of the delayed signals back to the inputs of the delay lines. If the feedback is zero, you'll hear only a single delayed copy of the signal. Turn up the **FEEDBACK** and you'll hear more copies which fade out with each repeat. A setting of 100 means that all of the delayed signal goes back to the inputs, sustaining the sound more or less indefinitely. A combination of a short delay time and a high feedback creates metallic, ringing sounds independent of the synthesizer voice itself.

A set of filters modifies the tone of the delayed signal. The **COLOR** knob controls these filters, brightening or darkening the sound of the delay. Turn it clockwise to reduce the low frequencies, making the sound thinner and brighter. Turn it anti-clockwise to reduce the highs, making the sound darker and warmer.

The two delay lines operate independently, potentially creating a wide stereo effect. Delays panned completely to the left and right sometimes sound *too* wide, so we've added a handy **WIDTH** knob. At 100% the delays are entirely separate, creating the widest separation. Turn the knob down to move the delays towards the center. A setting of zero gives a mono output.

The **MIX** knob simply adjusts the balance between the original signal and the delayed signal. 50% gives you an equal amount of both, 100% gives you just the delayed signal, and zero gives you just the original.

## Reverb

Reverberation, or reverb for short, is the reflections we hear when a sound bounces off the walls, floor, ceiling, and other objects around us. Artificial reverb can add realism to an electronic sound (like a synthesizer) or create unnatural effects. Quanta's reverb draws upon our experience with Adverb and Eos, our dedicated reverb plugins, but is a new processor built specifically for enhancing synthesized sounds.

The **DIFFUSION** knob controls how much the initial density of echoes (often known as early reflections) builds up over time. Turning up the diffusion increases the build-up of echoes immediately following the original signal.

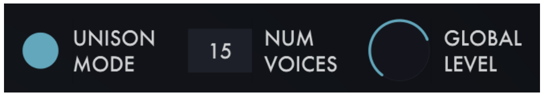
The **DECAY** parameter controls how long it takes for the reverberated sound to fade out. This control has the greatest influence on the overall sound of the effect. The range of this control is 0.1 to 10 seconds, which is approximately the amount of time that it takes the reverb sound generated by a full-volume signal to fade to silence. The actual amount of time it takes the signal to fade out is also affected by the **SIZE** control so the numeric value of **DECAY** should be considered a relative value.

The **SIZE** control varies the apparent size of the simulated acoustic space. As will be evident when you listen to it, rotating the **SIZE** knob changes the "bigness" of the reverberated sound. The **COLOR** knob is a simple-to-use tone control. Turning it to the left makes the reverb's sound darker, turning it to the right makes the sound brighter.

The **MIX** knob adjusts the relative loudness of the processed signal and the original signal. If you set it at zero, you'll hear only the original, unprocessed signal. If you set it at 100%, you'll hear only the reverberation.

## Output

The section near the upper-right corner of Quanta's window has a few controls for Quanta's overall output. They work as follows:



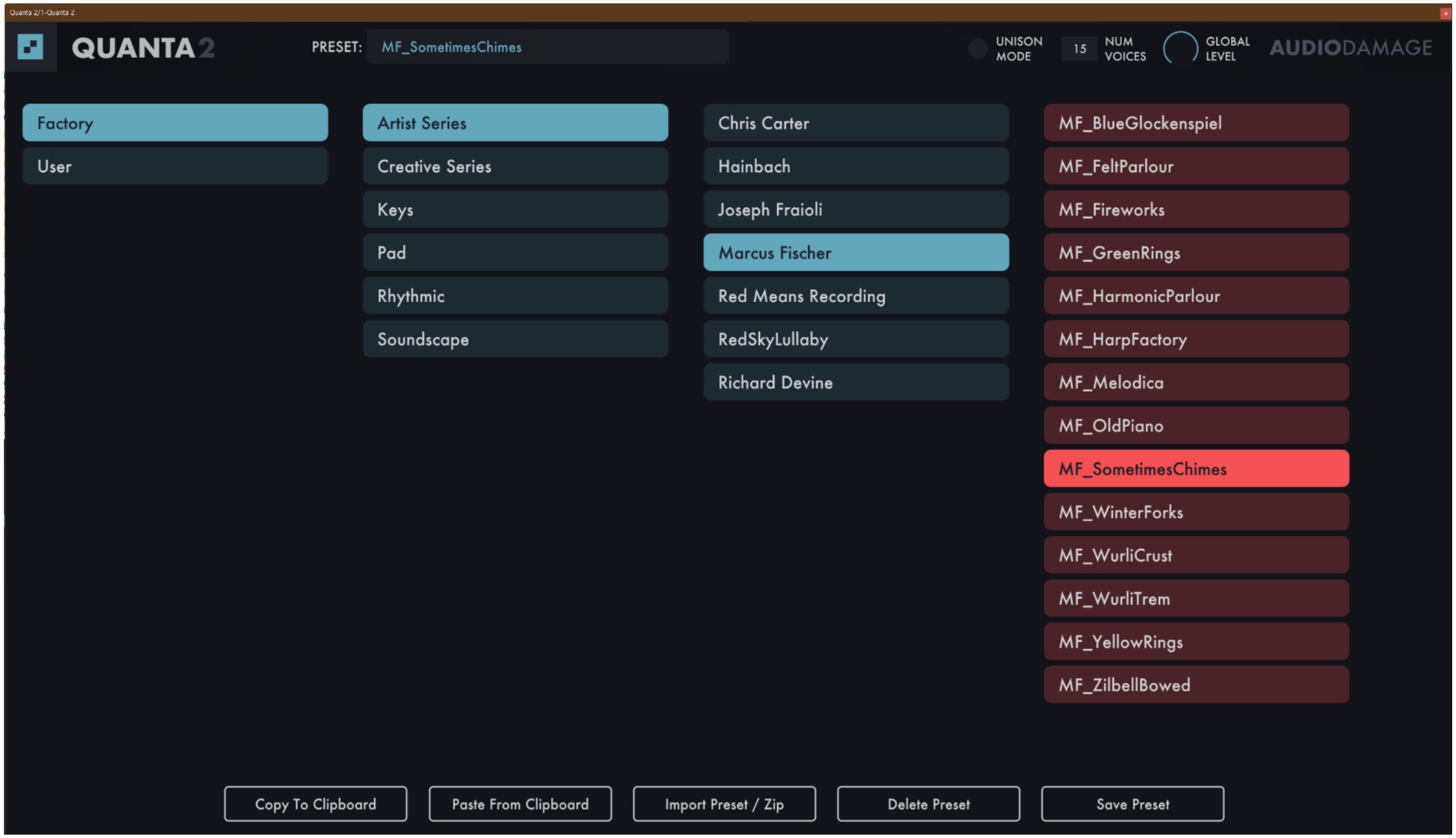

The **GLOBAL LEVEL** knob is unique amongst Quanta's controls in that it does two different things depending on how you use it. If you use it as a knob—that is, by moving it with your mouse or via your host's automation—it acts like a volume knob, controlling the overall loudness of the plugin's output, effects included. On the other hand, if you use it as a modulation destination, it sets the loudness of the signal emerging from the filters, before this signal enters the effects chain. In other words, as a modulation target, the global level acts like the final VCA in a synthesizer patch. As such, at least one of the FEGs must be connected to this modulation destination in order for Quanta to make any sound at all. FEG1 is connected by default, but you can use any of the four FEGs. Of course you can also add other modulation sources, such as an LFO for a tremolo effect. Modulation signals connected to **GLOBAL LEVEL** do *not* affect the final, post-effects output of the plugin.

When unison mode is turned on by clicking the **UNISON MODE** switch, Quanta's voices play simultaneously for each note. Turn this switch on to create thick sounds. You might find it useful to use the **T-RND** modulation source, routed to the **GRAIN FINE TUNE** and/or **OSCILLATOR FINE TUNE**, to create a touch of random detuning between the voices. Also, any of the **RAND** knobs in the granular oscillator will generate interesting variations between voices. The **NUM VOICES** popup menu lets you set the number of voices, with a maximum of 15, that play simultaneously when the **UNISON MODE** switch is on. Besides setting the number of voices that play in Unison mode, you can use this control to reduce the CPU load of the plugin.

# Presets

Quanta uses its own preset browser to organize, load, and save presets. To access the presets, click the name of the preset (to the right of the word **PRESET** at the top of the window) to open and close the preset browser. The first time you open the preset browser after installing Quanta, you'll see a big, blue button inviting you to download a collection of presets created by Audio Damage and other artists. Click this button to download and install these presets.

Presets are divided into two groups, designated User and Factory. Factory presets are those provided by us, while User presets are those which you create and save. Within the Factory presets are further categories and subcategories, shown as columns in the preset browser. The rightmost column lists the presets themselves. The groups and categories correspond to folders and sub-folders within Quanta's own folder. This folder is located at `C:\ProgramData\Audio Damage\Quanta2\` on Windows, and `~/Music/Audio Damage/Quanta2/` on macOS[4] and Ubuntu. Theoretically you can save your




[4] Yes, this is a departure from where presets were saved on a Mac in the past. Ask Apple why, not us.

presets anywhere you like, but in order for them to show up in Quanta's User list they must be placed in the User folder within Quanta's folder. Any folders you create within this folder will show up as categories in the User list. Two levels of folders will be recognized—you can put folders inside folders but no more nesting than that.

The scrolling list in the right column shows the available presets; click one of the preset names to load its settings. Clicking a preset name immediately changes some or all of Quanta's parameters, so if you have created a sound that you want to use again, save it as a new preset before loading another preset. To save your own presets, click the **SAVE PRESET** button. Quanta will prompt you to enter a name for the preset with a standard system file dialog box.

After you've clicked once in any of the columns, you can use the up and down arrow keys on your computer keyboard to move up and down in the lists. This is a convenient way to try the different presets within a folder.

Preset files are plain-text XML files so that you can exchange them online in forums, copy them between a Windows computer and a Macintosh, etc. Note that preset files can be large since they contain uncompressed, text-encoded copies of the sample files.

You can delete presets from the User list by clicking their name and then clicking the **DELETE PRESET** button. Quanta will give you a chance to confirm this action or cancel it. If you confirm, the preset's file will be removed from your storage system and is gone for good.

Similarly, the **DELETE FOLDER** button lets you delete entire folders, and their contents, with a single click. Use with caution.

The **IMPORT PRESET / ZIP** button provides a way to add presets to Quanta without manually moving them into the appropriate folders in your file system. Clicking this button produces a system file-browser window wherein you can select either a single preset file or a .zip file containing one or more presets. After you select the file, Quanta copies the preset(s) into whichever folder you have selected in Quanta's preset list, unzipping the file first if necessary.

The **COPY TO CLIPBOARD** and **PASTE FROM CLIPBOARD** buttons copy the current settings to the system clipboard and paste settings from the clipboard. You can use the copy and paste commands to transfer settings between two instances of Quanta or paste the settings into an email message or text editor. When copied to the clipboard, presets are presented in the same XML text as used in preset files.

## Default Preset

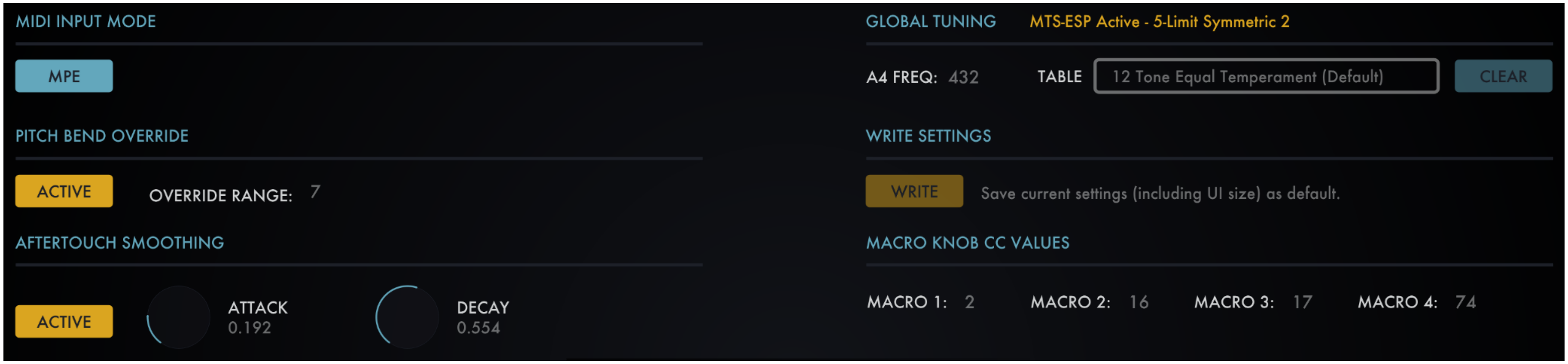
When Quanta downloads the factory presets it adds a preset to the User folder with the special name "Default". New instances of Quanta will load it automatically when you add them to your DAW session. Like any other preset file, you can overwrite this preset with your own preset. Doing so will give you a starting point with Quanta suited to your needs, maybe with a few modulation settings that you always use, maybe a complete sound with a sample included that you find yourself using on every new project.

## Migrating Presets from Version 1

Quanta 2 creates a new folder for its presets, leaving the folder created by version 1 untouched. If you want to use any of the presets which you created with version 1 in the new version of Quanta, simply copy the files from the old folder to an appropriate place in the new folder, using the system file tool of your choice (usually Windows Explorer on Windows, the Finder on macOS). Be aware that once you save a preset with version 2 of Quanta, it will no longer be usable with version 1. Therefore, we recommend making copies of your version 1 presets, rather than simply moving them from one folder to the other.

# Settings

The Settings panel contains controls for tailoring Quanta to your MIDI controller and playing preferences. You'll also find controls for manipulating Quanta's pitch standard and tuning. The settings in this panel are stored within your host DAW's session files, rather than within presets. Hence, they do not change when you load a preset file. These settings apply to individual instances of Quanta; two or more instances within one DAW session can have different settings.




## MIDI Input Mode

The **MPE** switch, under the heading "MIDI Input Mode", affects how Quanta handles MIDI notes and controller messages. If you have a MPE controller such as a Roger Linn Design Linnstrument or Madrona Labs Sounplane, turn this switch on. Quanta will then process pressure, pitch bend, and position information independently for each note, providing the expressivity that you expect from your controller. If you don't have a MPE controller, leave this switch turned off and ignore it.

As you're probably already aware, you also need a host program that can correctly transmit multi-channel MIDI information from your MPE controller to Quanta. Some hosts have some sort of switch that need to be turned on to enable MPE with virtual instruments.

## Pitch Bend Override

Quanta's modulation matrix allows MIDI pitch bend messages to control any parameter. The matrix provides default routings such that pitch bend affects the oscillator frequency and the grain tuning in a conventional manner, but any preset can have its own routings and ranges for the pitch-bend messages. Sometimes this flexibility is more than you want or need, such as when you're trying out a new controller or rattling through your presets to find candidates for your new cover of a Jan Hammer song.

If you turn on the Active switch, the pitch-bend range is set by the number shown as OVERRIDE RANGE. This value is in semitones; click and drag vertically to change it or double-click it to type a value. The modulation amount shown in the modulation matrix for **BEND -> OSCILLATOR TUNE** and/or **BEND -> GRAIN TUNE** will be overridden by this value *if* the value in the modulation matrix is something other than zero.

## Aftertouch Smoothing

We used a variety of MPE-equipped controllers while developing and testing Quanta. Most MPE controllers on the market provide their own software for adjusting and scaling their response to touch, pressure, position, and so on. We did not see a compelling reason to attempt to supplement or replace this functionality. However, we did find that it is often useful to smooth out the aftertouch (i.e. pressure) data originating from some controllers. The **ACTIVE** button turns on a simple smoothing filter with a response rather like a lag processor module found in some analog synthesizers. The **ATTACK** and **DECAY** knobs control the amount of smoothing: a higher setting produces more smoothing, that is, a slower change in output for a given change in input. The **ATTACK** knob affects increasing changes in value (more pressure) while the **DECAY** knob affects decreasing changes (less pressure).

Some controllers do not send a zero aftertouch value when you remove your finger from the key or pad. If Quanta's aftertouch smoother is active, the **AT** modulation source will always return to zero after a note ends. How quickly it fades to zero from its current value depends on the setting of the **DECAY** knob.

## Global Tuning

Quanta provides facilities for non-standard tuning and intonation. First, the **A4 FREQ** control simply adjusts Quanta's overall pitch. Standard tuning uses 440Hz for A above middle C. If you need to adjust Quanta's pitch slightly to match other instruments or recordings, or if you prefer a different pitch standard in your music, simply change the number in the text box, either by clicking and dragging vertically or double-clicking and typing a number.

Second, Quanta utilizes the MTS-ESP session-wide tuning system created by ODDSound, Ltd. (https://oddsound.com/). Once an MTS-ESP master plugin is present in your DAW, Quanta will automatically connect to it. Quanta then automatically updates its tuning whenever any changes are made in the master. When connected to a master, Quanta displays the current scale's name.

Third, Quanta's pitch reference, intonation, and/or keyboard mapping can be completely changed with TUN files. TUN files are a standard file for providing tuning information. If you're familiar with Scala but not TUN files, Scala can export TUN files. One TUN file contains the information that Scala places in separate SCL and KBM files. A web search will reveal plenty of information about creating TUN files. The presence of MTS-ESP takes priority over the TUN file.

To load a TUN file, click on the text field to the right of the word **TABLE**. Quanta will prompt you with a standard file dialog box; choose your file and Quanta will adopt the tuning and mapping found in that file. Once a file is loaded, Quanta keeps a reference to that file within its settings. If you move the TUN file, you'll have to re-load it into Quanta. Once a TUN file is loaded, the **A4 FREQ** control is disabled and cannot be changed. The pitch reference in the TUN file always overrides the **A4 FREQ** setting. To revert to the usual 12-note equal-tempered tuning, click the **CLEAR** button.

## Macro Knob CC Values

The four Macro knobs found in the Modulation panel respond to MIDI Continuous Controller (CC) messages, transmitted by the knobs and sliders on your MIDI keyboard, fader box, etc. The **MACRO KNOB CC VALUES** text fields in the Settings pane let you choose which Continuous Controller messages each Macro receives. To change a Macro's CC assignment, click and drag on the number to the right of the Macro's name. Alternatively, you can double click on the number, edit the number with your computer's keyboard, and press Enter or Return. You can find lists of MIDI CC numbers and their usual action by searching the web, but it's usually more relevant to consult the documentation for your MIDI controller to see which CC messages it sends.

## Write Settings

Clicking the **WRITE** button saves all the settings visible in the Settings panel to a file on your computer's storage device. Quanta loads this file when you add the plugin to a DAW session, so you can set up default tunings, Macro CC assignments, etc. to suit your needs. The file is named globals_q2.cont and is in the same folder as your user presets, that is, `C:\ProgramData\Audio Damage\Quanta2\` on Windows, and `~/Music/Audio Damage/Quanta2/` on macOS and Ubuntu.

## Automation

Most of Quanta’s controls can be automated using your host's automation features. The most notable exceptions are the FEG breakpoints and the modulation connections. The number of both of these attributes changes and host DAWs generally don’t permit plugins to have a changing number of parameters, so Quanta can’t expose these controls for automation. Consult your host's documentation for information on how to use its automation features.

## And Finally…

Thanks again for purchasing Quanta. We make every effort to ensure your satisfaction with our products and want you to be happy with your purchase. Please write to support@audiodamage.com if you have any questions or comments.