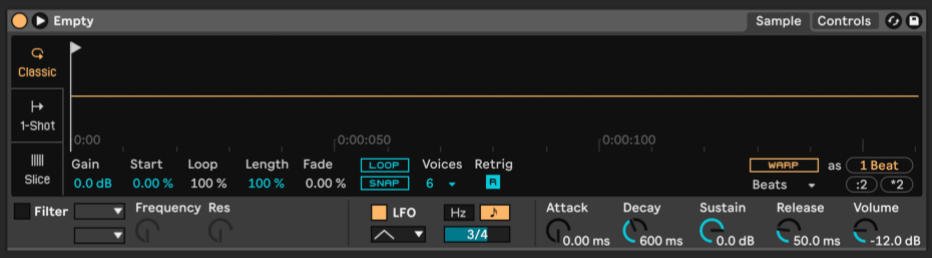
paula

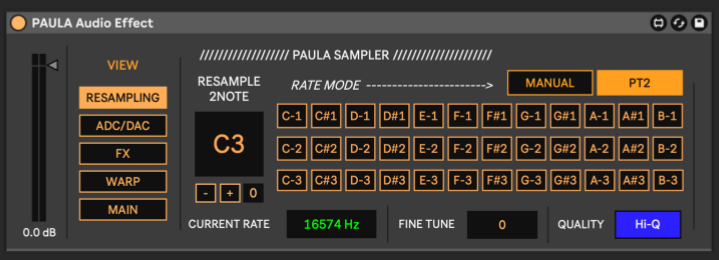
SIMPLER / SAMPLER / DRUM SAMPLER

USER MANUAL

Welcome

PAULA has now evolved beyond only emulating ProTracker 2/Amiga resampling behaviour, introducing ‘Rate Mode’ and independent wet/dry mix controls at the ADC/DAC stage, with a hugely improved internal audio signal chain, 50+ new parameters, massive performance improvements and important bug fixes. See the change log for more info. PAULA uses Max for Live, JavaScript, Node for Max and the Live API. v4.0 also introduces two new devices, ‘PAULA Sampler’ and ‘PAULA Drum Sampler’.





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Compatibility

PAULA Simpler 4.0 requires specific Ableton software versions:

- Ableton Live 12 and above.
- Max 9 and above.

Compatible on both Mac OS and Windows.

Max for Live is only bundled with Live Suite - Live Standard users must either upgrade to Suite or purchase the Max for Live add-on.

If you're using a version of Ableton older than version 12.2, you should manually update to Max 9 explained in the troubleshooting section.

PAULA Simpler runs at zero latency by default and has a maximum latency of 2.3 milliseconds with 'Hi-Quality' and all filters enabled.

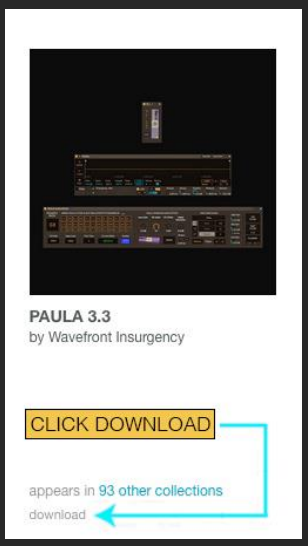
PAULA. 4.1 is ~23 MB :)

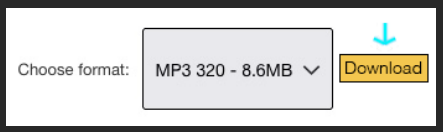
Download / Installation / Update

Download:

1. Navigate to your Bandcamp collection, locate ‘PAULA 4.0’ and click ‘download’.

2. Chose any format and click ‘Download’ again.





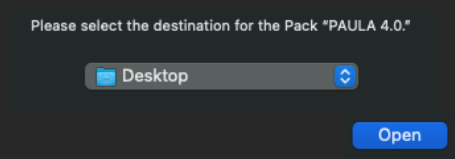
3. Extract the compressed (.zip) folder you just downloaded from Bandcamp.

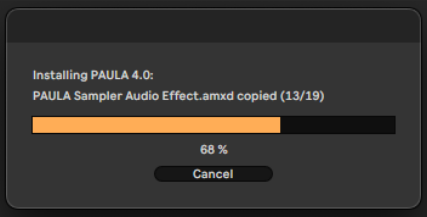
4. Continue to installation steps below.

Installation

1. Open the Ableton Live Pack ‘PAULA 4.0.alp’.

2. Choose somewhere temporary on your disk, such as the Desktop or the Documents folder and click ‘Open’.

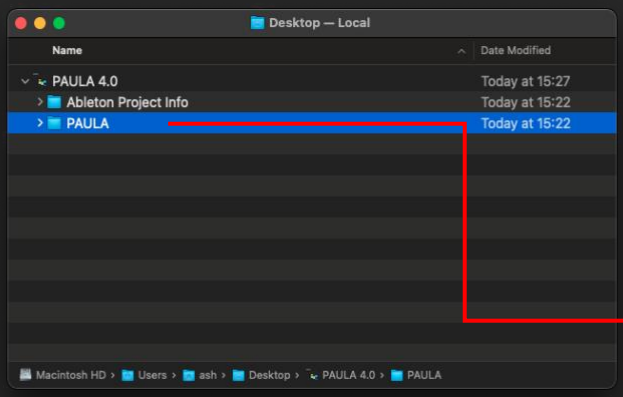


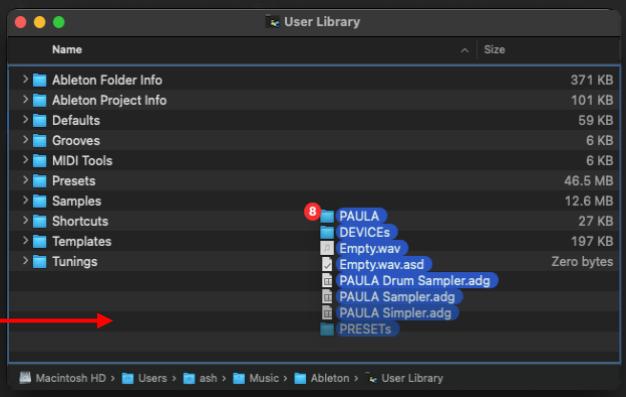


3. **Move the folder** ‘PAULA’ to anywhere into your Ableton User Library folder!

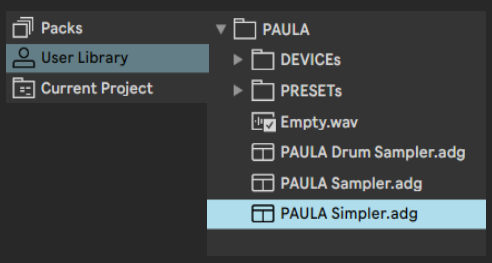
Default Ableton User Library location(s):

Mac OS: Macintosh HD/Users/[*username*]/Music/Ableton/User Library
Windows: \Users\[*username*]\Documents\Ableton\User Library





4. Always load ‘PAULA Simpler’, ‘PAULA Sampler’ and ‘PAULA Drum Sampler’ from your User Library.



5. Done.

You can now delete the folder ‘PAULA 4.0’.

Update

To update follow the ‘Installation’ steps above.

PAULA 4.0 implements many important bug fixes and correct naming of parameters meaning **the upgrade from 3.3 to 4.0 is not cross compatible.** The device folders have also been entirely restructured.

It’s recommended that you freeze and flatten all MIDI tracks with PAULA 3.3 and use the latest version. Then remove the ‘PAULA Sampler’ folder from your user library containing PAULA 3.3 to prevent future conflicts.

All future updates will be fully cross compatible from now on due to the proper implementation of parameter!

To update simply follow the ‘Install’ steps above.

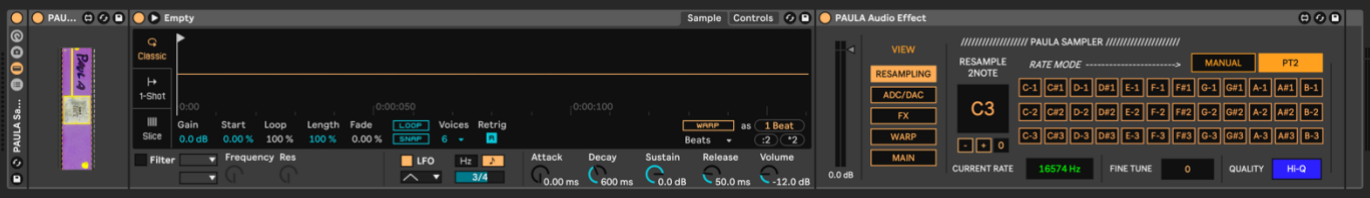
You can check for the most current versions of my Max for Live devices here:

https://www.wavefrontinsurgency.com/check-update/

Usage

Load the instrument rack ‘PAULA Simpler.adg’ from your user library via the Ableton browser.

PAULA Simpler is grouped in an instrument rack (.adg). The device should be kept in an instrument rack in the order of: [(PAULA MIDI Send) --> (Simpler) --> (PAULA Audio Effect)] as shown below.



Important: Please insert other MIDI effects and other audio effects outside of the grouped instrument rack as this will disrupt how the Live API calls different parameters.
PAULA now works with multiple instances on the same instrument rack as of v4.0!

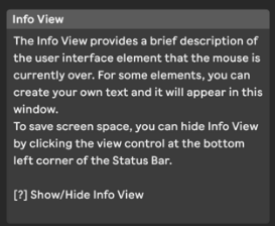
When working with a different sample, most of the time you will want to load ‘PAULA Simpler.adg’ from your user library onto a new MIDI channel.

All the useful parameters are automatable.

Continued below.

Info View / Hints

The ‘Info view’ displays useful information in this manual inside of Ableton. You’ll find most of the information you need to use PAULA in the info view.



To see tips, hover your mouse cursor over the parameter in question and a nonobstructive popup will display.

Show/Hide Info View = [?]

Saving Presets

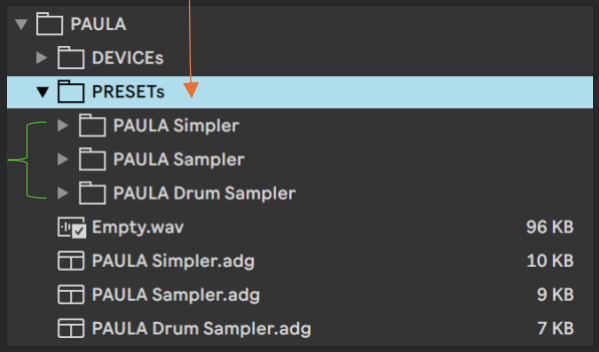
It's recommended that whenever you finish designing a sound using PAULA Simpler, to save the preset as an instrument rack (.adg) file. Saving presets using either method below will cache the sample loaded and prevent duplicate .amxd files from being created.

Method 1

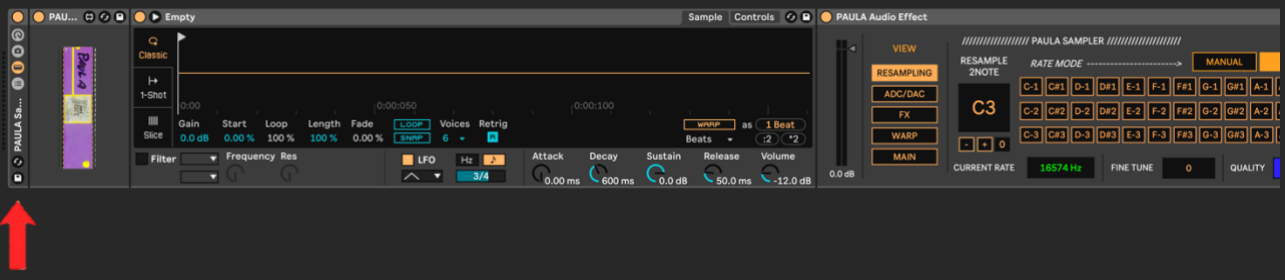
Simply drag and drop the device/instrument rack itself from the device title bar *anywhere* your user library. There is a subfolder inside of each individual device named 'PRESETs' for you to save your sounds into (see below).

Specifically click and drag the instrument rack which contains all three devices.

Store your presets into these folders.



Method 2



Alternatively, you can also click on the floppy disk icon on the instrument rack to save the preset to your user library root directory.

PAULA 4.0 Foreword

PAULA 4.0 introduces support for the Ableton Sampler device and Ableton Drum Sampler. The following instrument racks are delivered:

- PAULA Simpler.adg
- PAULA Sampler.adg
- PAULA Drum Sampler.adg

For the purpose of this manual, only ‘PAULA Simpler’ parameters are explained as all other devices also share these parameters.

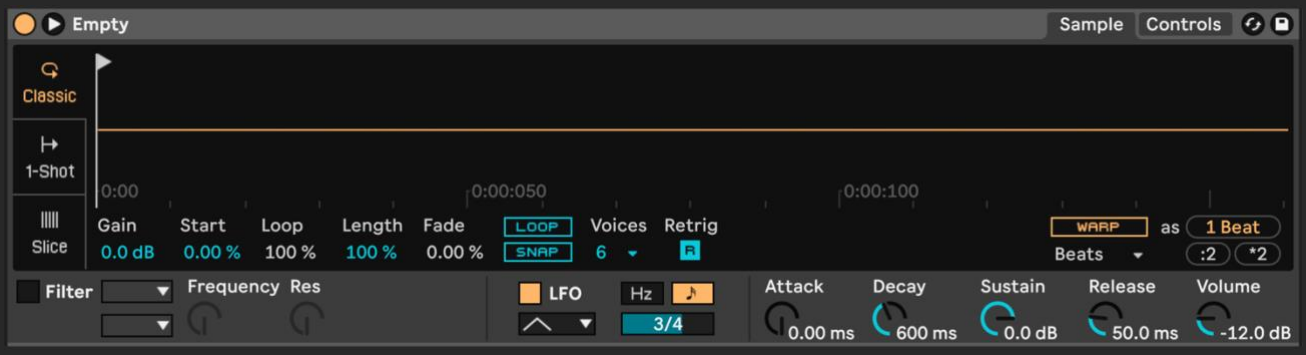
Note: All of the information on the parameters detailed below have an associated description inside of Ableton which can be accessed using the ‘Info view’ as explained above.

Devices

PAULA MIDI Send

The ‘Paula MIDI Send’ is a Max for Live MIDI device that transfers all incoming MIDI information to the simpler device and to the PAULA Audio Effect.

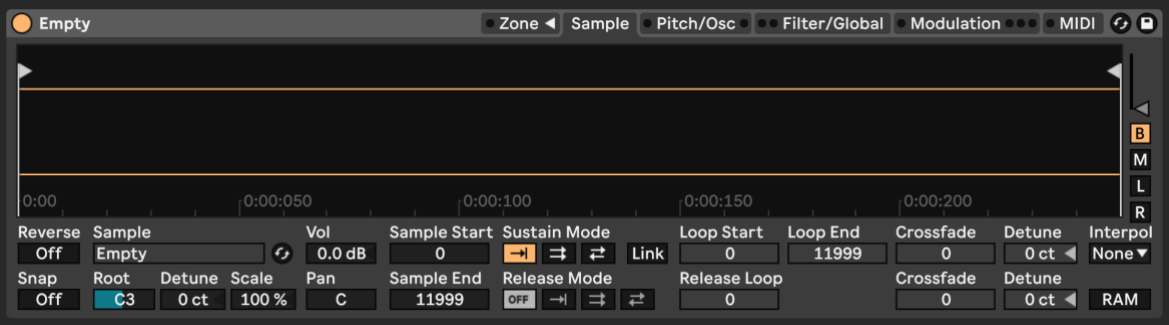
Simpler Device



The ‘Simpler’ device is the default Ableton Live sampler.

Check the online Ableton Live reference manual if you need help with this section HERE.

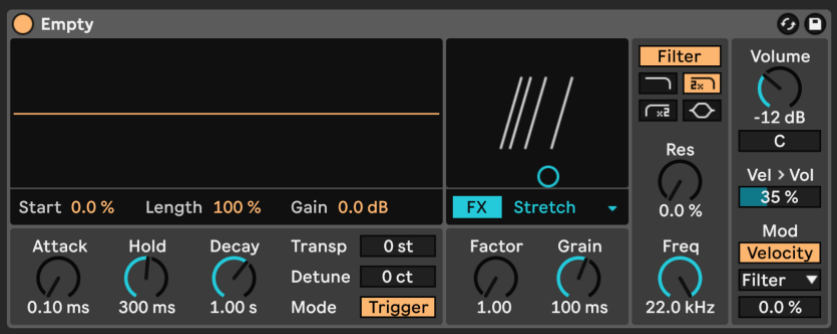
Sampler Device



The ‘Sampler’ device has different features that the ‘Simpler’ device isn’t capable of. The ‘Sampler’ device is more of a modern, old-school rendition of a sample and doesn’t support warping. Notably, it allows us to switch its pitch interpolation mode to ‘none’, complex looping modes and a much more in-depth modulation matrix.

Check the online Ableton Live reference manual if you need help with this section HERE.

Drum Sampler Device

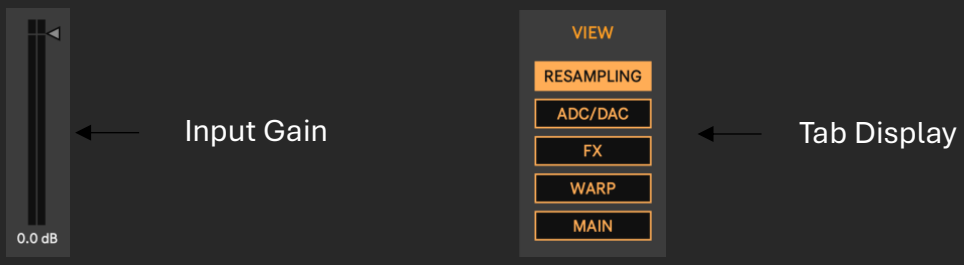


Drum Sampler is the most recent sampler added to Ableton.

Check the online Ableton Live reference manual if you need help with this section HERE.

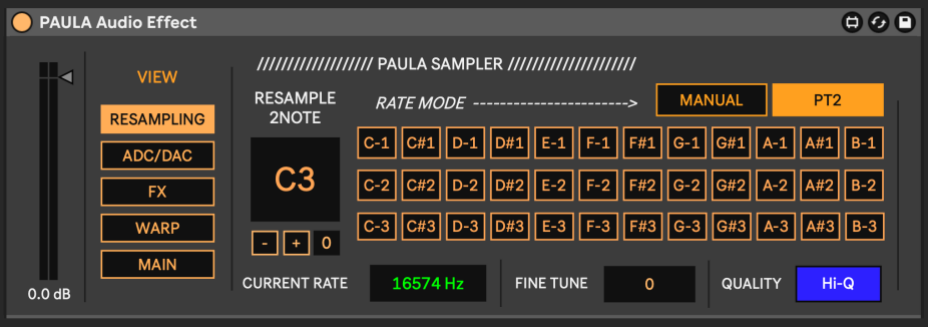
PAULA Audio Effect

GENERAL



- ‘Input Gain’ shows / controls the input gain into the PAULA audio effect. ‘Tab Display’ shows / hides the current tab.

RESAMPLING



- **RATE MODE:** Select the resampling mode.

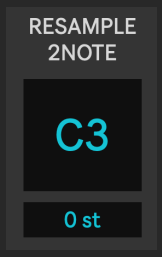
MANUAL: *All MIDI notes.* In ‘manual’ mode, the ‘Resample 2 Note’ section controls sample rate. Dynamic sample rate note tracking is disabled.

PT2: *MIDI notes C1 - B3 only.* In ‘PT2’ mode the ‘Resample 2 Note’ section controls sample transposition. Each key from C1 - B3 is assigned a specific sample rate, dynamically changing. Follows ProTracker 2 resampling behaviour. This mode theoretically combines both downsampling and upsampling and is based on ProTracker 2 resampling behaviour.

- **RESAMPLE 2NOTE:** Functionality depends on ‘Rate Mode’.

- In ‘PT2’ mode, the notes displayed represent sample pitch.
- In ‘Manual’ mode, the notes represent a specific sample rate.

MANUAL MODE:



As above:

MANUAL: All MIDI notes.

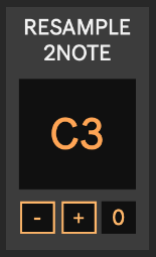
The ‘Resample 2 Note’ section controls sample rate. Dynamic sample rate note tracking is disabled.

In MANUAL mode, the ‘Resample 2 note’ functionality is highlighted in blue. There is also no specific note range.

- Transpose Pitch (Manual)

Pitch transposition between -48 to + 48 semitones.

PT2 MODE:

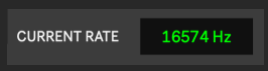


As above:

PT2: MIDI notes C1 - B3 only. The ‘Resample 2 Note’ section controls sample transposition. Each key from C1 - B3 is assigned a specific sample rate, dynamically changing. Follows ProTracker 2 resampling behaviour. (See tables below). This mode theoretically combines both downsampling and upsampling and is based on ProTracker 2 resampling behaviour.

- Octave Shift (PT2 Mode) [-12, 0, +12]

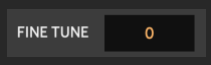
- Octave Shift Display (PT2 Mode) [Displays the current octave shift]

- Current Rate / Rate Hold: 

Click here to LOCK the current rate

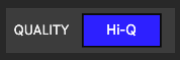
Displays the current sample rate. Click anywhere on the box to lock the current sample rate displayed. [Green = Unlocked, Red = Locked]

Hint: Lower sample rates result in increased imaging and more inharmonic tones. Finding the right sample rate requires experimentation and when done right will result in harmonic tones. It's recommended to lock the sample rate while using slice mode.

- Fine Tune: 

'Fine Tune' follows ProTracker 2 fine tuning behaviour. Value range is between -8 to +7. Each step is equivalent to 12.5 cents.

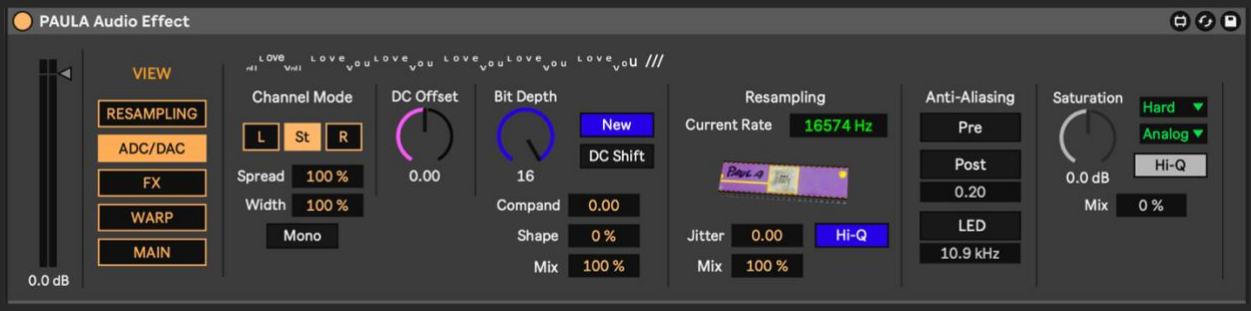
Hint: 'Fine Tuning' also alters the sample rate(s) based on the ProTracker 2 tables. [See 'Tables' appendix of manual].

- Resampling Quality: 

'Hi-Q' = High quality resampling. 'Eco' = Economical resampling.

Hi-Q add 1.5 ms of Latency. Using Eco mode and enabling 'POST FILTER' can get rid of harsh ringing in the high frequencies.

ADC/DAC (Analog to Digital Conversion / Digital to Analog Conversion)



- Channel Mode: 

L: Left channel only. St: Stereo. R: Right channel only.

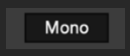
- Spread: 

Spread parameter creates a rich stereo chorus by using two voices per note and panning one to the left and one to the right. The two voices are detuned, and the amount of detuning can be adjusted with the Spread control.

When warp mode 'Beats' or 'Repitch' is enabled, the spread parameter is disabled / bypassed.

- Width: 

Stereo width control.

- Mono Sum: 

Sums left and right channels.

- DC Offset:

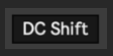
A DC offset adds a constant voltage (bias) to an audio signal so that its waveform is shifted up or down relative to 0 V. Cheap vintage sampling devices typically introduced a DC offset.

- Bit Depth:

Sets the bit depth. Bit reduction decreases the number of bits used to represent the digital signal, reducing dynamic range while adding distortion and noise.

- Bit Crusher Type: 

New = Redux. Old = degrade~.

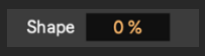
- DC Shift: 

Enabling the DC Shift button applies an amplitude offset before the quantization process. This significantly changes the sound of the quantization distortion, especially when Bits is set to lower values, increasing volume and adding crunch!

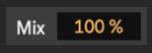
- Compander: 

α-law compression / expansion sandwiched between the bit crushing. Improves the signal to noise ratio using low bit depths.

Check out DIGITIZE, another M4L device on my Bandcamp for more information.

- Quantizer Shape: 

Shape varies the shape of the quantizer's characteristic curve. Higher Values produce a finer resolution for smaller amplitudes, meaning that subtle signal components will be less affected than louder ones. The total amount of distortion produced with different. Shape settings will depend upon the dynamic range of the input signal.

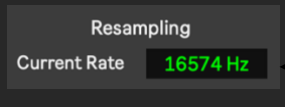
- Bit Crusher Mix: 

Sets the mix A.K.A dry/wet.

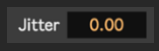
Click here to LOCK the current rate

- Current Rate / Hold:

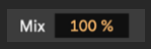
Displays the current sample rate. Click anywhere on the box to lock the current sample rate displayed.



Lower values result in increased imaging and more inharmonic tones. Finding the right sample rate requires experimentation and when done right will result in harmonic tones. It's recommended to lock the sample rate while using slice mode.

- Resampling Jitter: 

Jitter adds noise to the downsampler's clock signal, which introduces randomness to the downsampling process. This results in a noisier sound, as well as increased stereo width.

- Resampling Mix": 

Sets the mix A.K.A dry/wet.

- Resampling Quality: 

'Hi-Q' = High quality resampling. 'Eco' = Economical resampling.

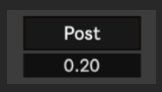
Hi-Q add 1.5 ms of Latency. Using Eco mode and enabling 'POST FILTER' can get rid of harsh ringing in the high frequencies.

- Pre-Filtering: 

Pre button engages a filter before downsampling, which reduces the bandwidth of the signal processed by downsampling.

- Post Filter:

Post button engages a low-pass filter after the downsampling process, which reduces imaging.

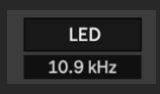


- Post Filter Adjust:

Tunes the position of the post-filter with respect to the resampling frequency. When zero, the filter is located at half the resampling rate.

- LED Filter:

A1200 filter cutoff when enabled, applies a 2nd-order Butterworth low-pass filter at 3091 Hz.



- LED Filter Adjust:

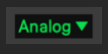
Adjusts the LED filter cutoff frequency.

- Saturation Amount:

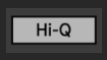
Adjusts input signal gain into saturation. Automatic gain compensation built-in.

- Post Clip Mode:

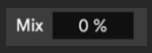
Select a post clipping stage. When Soft or Hard is selected, Saturator's output will never exceed the level set by the Output control.

- Signal Shaping Mode: 

In the Analog Clip and Digital Clip modes, the signal is clipped completely and immediately. Soft Sine, Medium Curve and Hard Curve modes soften signal clipping to varying degrees. Sinoid Fold mode can be good for special effects.

- Saturation Quality: 

Aliasing from the saturation can be reduced by enabling Hi-Quality mode. Adds 0.068 ms latency.

- Saturation Mix: 

Sets the mix A.K.A dry/wet.

FX

- Ring Modulation On/Off:

Enable/disable ring modulation audio effect. The ring modulation frequency amount in Hertz is added to and subtracted from the input.

- Ring Modulation Frequency:

Set the ring modulation frequency.

- Ring mod Mix:

Sets the mix A.K.A dry/wet.

- Doubler On/Off:

Enable/disable doubler audio effect. Doubler creates the effect of doubled tracks (multiple stacked versions of similar recording takes) by adding time-modulated delayed signals to the input.

- Doubler Time:

Sets the doubler time in milliseconds.

- Doubler Feedback:

Sets the doubler feedback.

- Doubler Modulation Amount:

Sets the doubler modulation amount.

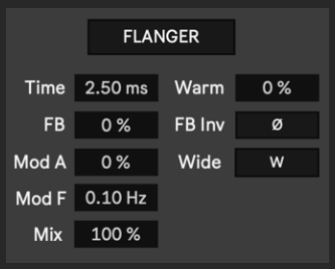
- Doubler Modulation Rate:

Sets the doubler modulation rate.

- Doubler Mix:

Sets the mix A.K.A dry/wet.

- Flanger On/Off:



Enable/disable flanger audio effect. Flanger creates a continuously changing comb filter effect by adding a time-modulated delayed signal with feedback to the input.

- Flanger Time:

Adjusts the delay time of the flanger delay lines.

- Flanger Feedback:

Flanger feedback amount.

- Flanger Modulation Amount:

Flanger modulation amount.

- Flanger Modulation Frequency:

Flanger modulation frequency.

- Flanger Mix:

Sets the mix A.K.A dry/wet.

- Flanger Warmth:

Warmth adds slight distortion and filtering for a warmer sound. Turn it up for more crunch!

- Feedback Invert:

The feedback signal can be inverted using the Ø button, which results in a “hollow” sound when combined with high feedback values.

- Flanger Wide:

Enable/disable flanger LFO stereo mode offset.

- Shifter On/Off:

Enable/disable shifter audio effect. Adjusts the pitch of incoming audio up or down by a user-specified amount in semitones.

- Pitch Shifter Amount:

Pitch shifting amount in semitones.

- Shifter Window Size:

Sets the windows size in ms used by the pitch shifting algorithm.

- Pitch Shifter Mix:

Sets the mix A.K.A dry/wet.

- Phasor On/Off:

Enable/disable phasor audio effect. Delays the left audio channel creating phasor effect.

- Phasor Offset:

Delays the left audio channel creating phasor effect. This control is in milliseconds.

- Phasor Feedback:

Controls phasor feedback.

- Phasor Wide:

Enables/disables mono summing of L/R channels.

- Phasor Spread:

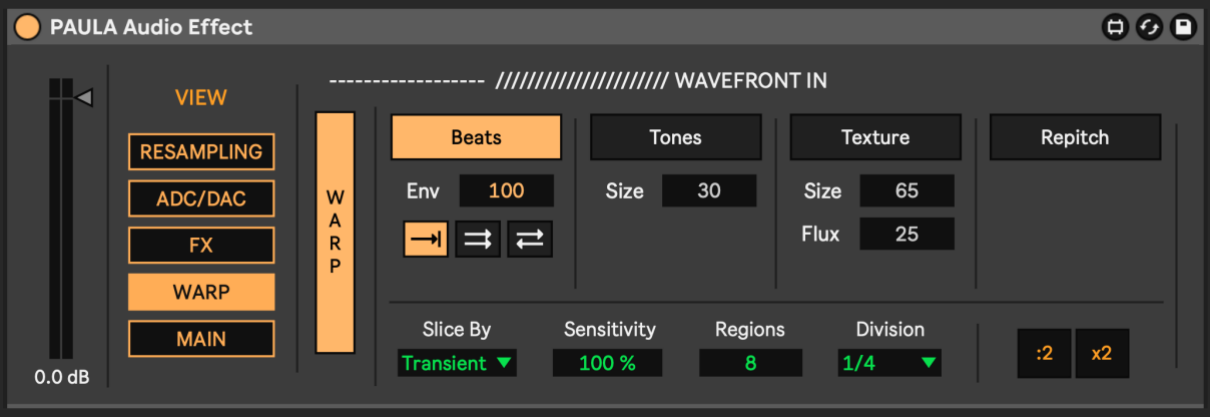
Stereo spread control.

Hint: When off, the phasor is disabled, but the spread control will still work.

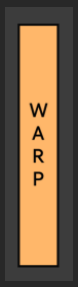
- Phasor Mix:

Sets the mix A.K.A dry/wet.

WARP



- Enable/Disable Warp:



Enables warping in simpler.

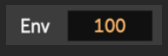
If using timed percussion, ensure that the simpler device is in time with grid / project tempo. You can do this using the 'Warp Region' parameter on the simpler device [as 1 beat, 2 bars, etc].

- Warp Mode:

Select between Ableton's built in warping algorithms controlled within simpler.

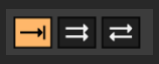
Retrigger is required to update warp mode. When automation is drawn in, the undo history flooding won't persist.

- Beat Envelope Size:



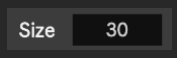
The Transient Envelope control determines the volume fade between each audio segment. When set to 100, no fade is applied, while at 0, longer fades are added, causing each segment to decay very quickly. Higher envelope times can help to smooth out any clicks between segments; lower envelope times can be used to create rhythmic gating effects.

- Transient Warp Mode:



Transient envelope setting. Loop Off. Loop Forward. Loop Back-and-Forth.

Manual inputting the value will flood your undo history! However, this will not persist once automation is recorded.

- Tone Grain Size: 

Grain Size lets you roughly adjust the average size of the grains used. The actual grain size is determined by the clarity of pitch changes in the audio. Small grain sizes work best for audio that has distinct pitch variations. Using larger grain sizes can help prevent unwanted noise but may also cause audible artifacts.

Manual inputting the value will flood your undo history! However, this will not persist once automation is recorded.

- Texture Grain Size: 

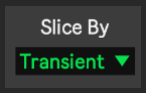
The Grain Size control determines the grain size used, but unlike in Tones mode, the audio's tonal characteristics are not taken into consideration when the grain size is adjusted.

Manual inputting the value will flood your undo history! However, this will not persist once automation is recorded.

- Texture Flux: 

Flux introduces randomness into how the sample is processed. Higher values result in more random variation.

Manual inputting the value will flood your undo history! However, this will not persist once automation is recorded.

- Slice By: 

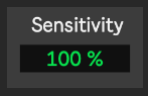
The Slice By chooser determines the specific way in which slices will be created:

Transient - Slices are placed on the sample's transients automatically. The Sensitivity slider determines how sensitive Simpler is to transient levels within the sample, and thus how many slices will be automatically created. Higher numbers result in more slices, up to a maximum of 64 slices.

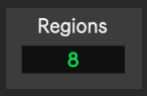
Beat - Slices are placed at musical beat divisions. The Division chooser selects the beat division at which Simpler will slice the sample region.

Region - Slices are placed at equal time divisions. The Regions chooser selects the number of evenly-spaced slices that will be created.

Manual - Slices are created manually, by double-clicking within the sample region. When Manual is selected, no slices are placed automatically.

- Sensitivity: 

The sensitivity slider determines how sensitive Simpler is to transient levels within the sample, and thus how many slices will be automatically created. Higher numbers result in more slices, up to a maximum of 64 slices.

- Regions: 

Slices are placed at equal time divisions. The Regions chooser selects the number of evenly-spaced slices that will be created.

- Division: 

The Division chooser selects the beat division at which Simpler will slice the sample region.

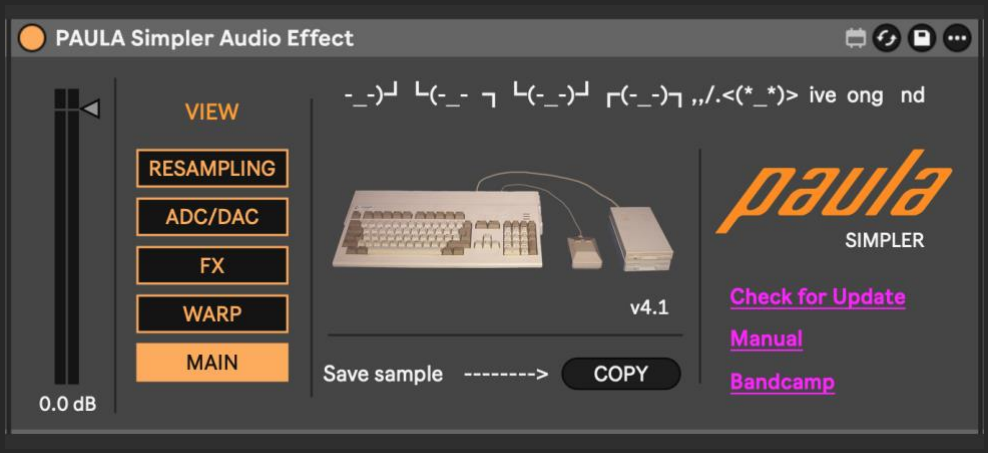
- Double Tempo: 

÷2 or ×2 buttons to double or halve the playback speed, respectively.

- Halve Tempo: 

÷2 or ×2 buttons to double or halve the playback speed, respectively.

MAIN



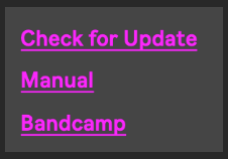
The ‘Main’ page has a few links and the simpler device has a save sample ‘COPY’ button that saves the sample currently loaded in the Simpler device to the “PAULA SAMPLEs" folder at the root of your Music directory.

Mac: /Users/*username*/Music/PAULA SAMPLEs

Windows: C:\Users*username*\Music\PAULA SAMPLEs

- Check for Update:

Opens website that displays current version and other important info.



- Manual:

Opens this manual.

- Bandcamp

Open WAVEFRONT INSURGENCY ‘s Bandcamp.

Extra

Shoutout and credit to 8bitbubsy for creating the open source pt2-clone, helping with my research. Also thank you Ableton for implementing .abl devices into Max helping me to migrate away from the dependency on TAL-DAC. Initially developed alongside the MANY WORLDS SAMPLE CD. Signup to the mail list on my Bandcamp to get updates.

THANKS FOR ALL THE SUPPORT!

Troubleshooting

Max 9 required:

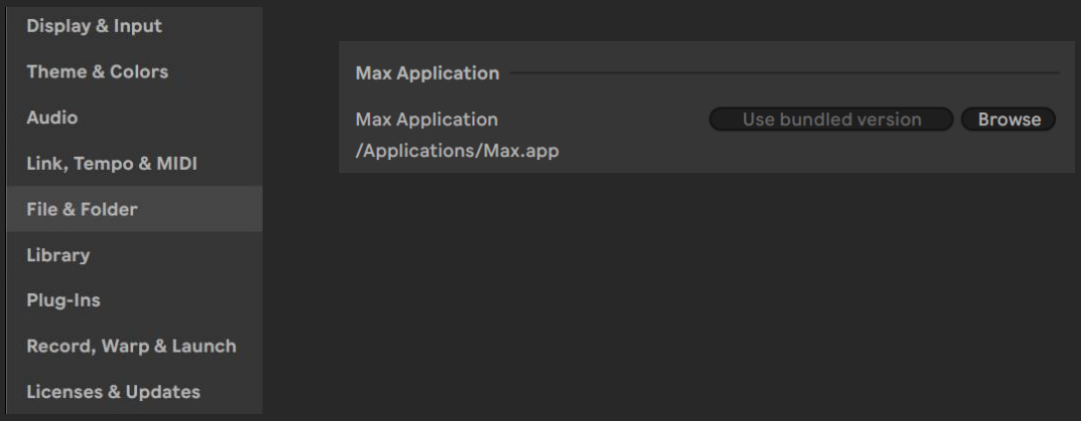
PAULA requires **Max 9 or later** due to the new implementation of abl. objects! If you're running PAULA simpler on any Ableton version before 12.2 you will need to manually updated Max described below.

1. Download Max 9 or above from: https://cycling74.com/downloads and install.

2. Open Ableton and navigate to 'Settings' then 'Files & Folder'.

3. Under 'Max Application', click the 'Browse' button. Navigate and chose the newly installed Max 9 application (Mac OS) or Max 9 application folder (Windows).

4. Restart Ableton Live.



Undo History Flooding:

PAULA will flood the undo history when any of the warping parameters, 'Beat Envelope', 'Tone Grain Size' and 'Texture Grain Size' numbers are manually input. However, when automation is recorded, the undo history flooding won't persist. If any problems are encountered with the undo functionality, I recommend accessing the undo history (Live 12 only) by clicking cmd+option+z (mac) or ctrl+alt+z (windows). Another alternative is to freeze/flatten the track.

Similarly, when PAULA is set to PT2 mode, the change in sample rates also populates the undo history. It's recommended to hold the rate once a desired value is found. You can do this in any rate mode by clicking the displayed value.

Click here to LOCK the current rate

Email me if you need technical support: *ash@wavefrontinsurgency.com*

Change Log

PAULA 4.1

New: Save sample to disk. Saves an unaltered copy of the sample loaded in the simpler instrument to your music folder: ”/Music/PAULA SAMPLEs”

Change: Default resampling quality set to ‘Eco’.

Bug fix: In some cases, MIDI would stop transmitting if the PAULA Audio Effect was switched off.

Removed / Bug Fix: ‘Main’ channel EQ as it was causing a low end roll off unintentionally.

Removed: ‘Main’ output gain control as it wasn’t useful.

PAULA 4.0

New Features / Parameters / UI improvements:

- New ‘MANUAL’ and ‘PT2’ rate modes overhauling PAULA resampling functionality (see manual for more info).
- Redesigned ‘PAULA Simpler Audio Effect’ UI featuring tabbed views, reducing onscreen clutter.
- Redesigned and improved ADC/DAC signal flow, 17 new parameters. Most stages now have an independent dry/wet control and overall, more versatility.
- 3 new FX including an updated flanger and phasor, 24 new parameters.
- Expanded automatable warp / timestretching, 6 new parameters.
- New input and output gain control.
- Now reports latency to Live. (0 ms min, 2.3 ms max)
- ‘PAULA MIDI Send’ redesigned.
- New detailed manual.

Bug Fixes / Stability

- Fixed Live API querying. PAULA Simpler now supports multiple instances on the same instrument rack!
- Improved performance (~80 % performance increase, reducing CPU load), simplifying overall patch in preparation for future updates.
- Improved stability. Fixed bug that was causing GUI lag when opened in device editor.

- Communication between Max devices simplified. Also fixed MIDI passthrough (pitch bend, poly, etc now sent to the simpler device).

Removals & Moved Parameters

- Moved: Flanger x2 feedback. (Replaced with feedback numbox).
- Moved: Phasor mono unlink. (Replaced with phasor wide mode)
- Removed: Reverse buttons (prevents a bug that causes the sample to reverse on launch). To reverse your sample, right click the waveform in simpler and select ‘reverse’.
- Removed EQ mid frequency control, now locked at 1.7 kHz.
- Removed C3 Rate Hold Mode - Made redundant with implementation of new rate mode, ‘manual’.
- Removed automatic naming system as it was crating conflicts and performance issues.

PAULA 3.3

- New Standalone Device: PAULA Audio Effect [STANDALONE]: Standalone device is free of all simpler integration and is designed for use on an audio track.
- Bug Fix: Input gain would unexpectedly un-map reopening a project. New method of controlling input gain implemented using macro control via the Live API.
- New parameter: U button: When enabled, the ‘Phasor’ and the ‘MONO’ effect are unlinked.

PAULA 3.2

- Renamed .amxd devices and instrument rack so that all future updates are forwards compatible!
- Added ‘Nyquist Limit Post-Filter Adjust’ parameter.
- Added: Automatic MIDI track naming.
- Bug Fix: Default value ‘input gain’ now correctly loads at -12 dB.
- Bug Fix: Default ‘mid-range frequency’ now loads at 1.7 kHz.
- Updated Ableton ‘Info View’ description of each parameter, including hints on hover.
- Updated manual.
- UI improvements.

PAULA 3.1

- Bug Fix: Missing transient warp icons now embedded correctly.
- Improvement: Simpler ‘Volume’ is now remotely controlled by the ‘Input Gain’. Also changed volume range -18 dB to +6 dB.

- Updated Manual (Small changes only).
- Improved UI colour scheme.
- ‘PAULA MIDI Send.amxd’ is now hidden in the rack by default.
- Changed EQ default mid-range frequency to 1.7 kHz.

PAULA 3.0

- Ableton’s Simpler device has been fully integrated with PAULA, utilising the Ableton Live API – Controls include: Transposition, Fine Tune, Warping, Warp Mode, Warp Grain Size / Envelopes, X2, /2, Reverse and Voicing. As simpler is used, sample location is now managed by Ableton.
- Realtime time stretching: Ableton warp modes, grain size, x2 and /2 and reverse functionality. All
support parameter automation.
- Fine tuning that follows ProTracker 2 behavior and including slight sample rate variations.
- Quality mode: Eco and Hi-Q resampling algorithms available.
- LED filter moved to the end of the signal flow.
- Added optional antialiasing filter set at half the sample rate ‘POST FILTER’.
- Added Ableton channel EQ abl. Object for ease of use.
- Added Flanger effect built in with rate modulation, x2 feedback and stereo mode.
- ‘C3 Hold’ enables monophonic playback, vice versa.
- Increased ‘RESAMPLE 2NOTE’ range to include A#3 and B-3 notes.
- Redesigned and improved MIDI flow.
- Improved UI including visual feedback.
- Updated manual.

PAULA 2.1

NOTE: IMPORTANT UPDATE - Fixes a bug that prevented some MIDI notes from playing!

- Bug fix: Enabled polyphonic voice stealing.
- Removed .alp installer for simplicity.
- Switched ‘RESAMPLE2NOTE’ parameter visibility to store only (disabled automation tracking).

PAULA 2.0

- No longer dependent on TAL-DAC and works entirely standalone using new Max abl. objects in Max 9.

- New features: C3 Hold, Sample Rate Hold, Trim, DC offset, Phasor Effect, High and Low Shelf EQ, Mono Button and the Current Sample Rate is now displayed.
- Bug fixes: Limited note range to C1-B3 in respect to the sample rate ranges pt2 tables (4144 – 31338 Hz). MIDI triggering now works as expected. No more random noises.
- .alp packing including lesson/example project.
- Created PDF manual.
- Added fade on load to remove audible pop/click.
- Check Max version displays pop-up/screen warning if below v9.0.0. - Improved UI.
- Implemented dynamic theming (light/dark mode)
- Switched to Bandcamp for distribution

PAULA 1.94

- Initial release.

Tables ProTracker note frequencies (PAL)

Fine Tune: +7

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	4357	2179
C#1	4618	2309
D-1	4892	2446
D#1	5186	2593
E-1	5491	2746
F-1	5815	2908
F#1	6169	3085
G-1	6532	3266
G#1	6914	3457
A-1	7328	3664
A#1	7761	3881
B-1	8229	4115
C-2	8715	4358
C#2	9237	4619
D-2	9771	4886
D#2	10371	5186
E-2	10981	5491
F-2	11629	5815
F#2	12316	6158
G-2	13040	6520
G#2	13855	6928
A-2	14657	7329
A#2	15557	7779
B-2	16421	8211
C-3	17387	8694
C#3	18473	9237
D-3	19596	9798
D#3	20742	10371
E-3	22030	11015
F-3	23335	11668
F#3	24631	12316
G-3	26080	13040
G#3	27710	13855
A-3	29313	14657
A#3	31113	15557
B-3	32842	16421

Fine Tune: +6

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	4325	2163
C#1	4583	2292
D-1	4859	2430
D#1	5148	2574
E-1	5448	2724
F-1	5777	2889
F#1	6115	3058
G-1	6484	3242
G#1	6874	3437
A-1	7283	3642
A#1	7711	3856
B-1	8173	4087
C-2	8651	4326
C#2	9165	4583
D-2	9718	4859
D#2	10281	5141
E-2	10914	5457
F-2	11553	5777
F#2	12231	6116
G-2	12945	6473
G#2	13748	6874
A-2	14536	7268
A#2	15421	7711
B-2	16345	8173
C-3	17302	8651
C#3	18378	9189
D-3	19382	9691
D#3	20621	10311
E-3	21760	10880
F-3	23032	11516
F#3	24461	12231
G-3	25890	12945
G#3	27495	13748
A-3	29073	14537
A#3	30843	15422
B-3	32540	16270

Fine Tune: +5

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	4294	2147
C#1	4553	2277
D-1	4819	2410
D#1	5111	2556
E-1	5415	2708
F-1	5730	2865
F#1	6073	3037
G-1	6437	3219
G#1	6821	3411
A-1	7224	3612
A#1	7661	3831
B-1	8116	4058
C-2	8588	4294
C#2	9095	4548
D-2	9638	4819
D#2	10222	5111
E-2	10814	5407
F-2	11479	5740
F#2	12147	6074
G-2	12851	6426
G#2	13642	6821
A-2	14477	7239
A#2	15288	7644
B-2	16196	8098
C-3	17218	8609
C#3	18189	9095
D-3	19277	9639
D#3	20384	10192
E-3	21627	10814
F-3	22883	11442
F#3	24294	12147
G-3	25702	12851
G#3	27284	13642
A-3	28837	14419
A#3	30577	15289
B-3	32540	16270

Fine Tune: +4

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	4263	2132
C#1	4518	2259
D-1	4787	2394
D#1	5074	2537
E-1	5374	2687
F-1	5693	2847
F#1	6032	3016
G-1	6391	3196
G#1	6769	3385
A-1	7165	3583
A#1	7595	3798
B-1	8043	4022
C-2	8526	4263
C#2	9048	4524
D-2	9586	4793
D#2	10134	5067
E-2	10748	5374
F-2	11368	5684
F#2	12064	6032
G-2	12759	6380
G#2	13538	6769
A-2	14360	7180
A#2	15223	7612
B-2	16122	8061
C-3	17052	8526
C#3	18096	9048
D-3	19172	9586
D#3	20268	10134
E-3	21496	10748
F-3	22737	11369
F#3	24129	12065
G-3	25517	12759
G#3	27076	13538
A-3	28604	14302
A#3	30315	15158
B-3	32245	16123

Tables ProTracker note frequencies (PAL)

Fine Tune: +3

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	4233	2117
C#1	4484	2242
D-1	4755	2378
D#1	5038	2519
E-1	5334	2667
F-1	5648	2824
F#1	5991	2996
G-1	6345	3173
G#1	6718	3359
A-1	7122	3561
A#1	7547	3774
B-1	7989	3995
C-2	8465	4233
C#2	8979	4490
D-2	9509	4755
D#2	10076	5038
E-2	10683	5342
F-2	11296	5648
F#2	11983	5992
G-2	12667	6334
G#2	13435	6718
A-2	14245	7123
A#2	15093	7547
B-2	15977	7989
C-3	16971	8486
C#3	17914	8957
D-3	18967	9484
D#3	20153	10077
E-3	21367	10684
F-3	22592	11296
F#3	23966	11983
G-3	25335	12668
G#3	26870	13435
A-3	28375	14188
A#3	30058	15029
B-3	31954	15977

Fine Tune: +2

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	4202	2101
C#1	4456	2228
D-1	4717	2359
D#1	5003	2502
E-1	5294	2647
F-1	5612	2806
F#1	5941	2971
G-1	6300	3150
G#1	6667	3334
A-1	7066	3533
A#1	7483	3742
B-1	7935	3968
C-2	8405	4203
C#2	8912	4456
D-2	9433	4717
D#2	9991	4996
E-2	10588	5294
F-2	11224	5612
F#2	11902	5951
G-2	12578	6289
G#2	13334	6667
A-2	14131	7066
A#2	14966	7483
B-2	15834	7917
C-3	16810	8405
C#3	17824	8912
D-3	18866	9433
D#3	20039	10020
E-3	21239	10620
F-3	22449	11225
F#3	23805	11903
G-3	25155	12578
G#3	26668	13334
A-3	28375	14188
A#3	30058	15029
B-3	31669	15835

Fine Tune: +1

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	4173	2087
C#1	4423	2212
D-1	4685	2343
D#1	4961	2481
E-1	5262	2631
F-1	5568	2784
F#1	5902	2951
G-1	6256	3128
G#1	6630	3315
A-1	7024	3512
A#1	7436	3718
B-1	7882	3941
C-2	8346	4173
C#2	8845	4423
D-2	9359	4680
D#2	9935	4968
E-2	10525	5263
F-2	11154	5577
F#2	11823	5912
G-2	12489	6245
G#2	13235	6618
A-2	14019	7010
A#2	14841	7421
B-2	15764	7882
C-3	16652	8326
C#3	17646	8823
D-3	18767	9384
D#3	19815	9908
E-3	20988	10494
F-3	22308	11154
F#3	23646	11823
G-3	24978	12489
G#3	26469	13235
A-3	28150	14075
A#3	29806	14903
B-3	31388	15694

Fine Tune: 0

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	4144	2072
C#1	4390	2195
D-1	4655	2328
D#1	4926	2463
E-1	5231	2616
F-1	5542	2771
F#1	5872	2936
G-1	6223	3112
G#1	6593	3297
A-1	6982	3491
A#1	7389	3695
B-1	7830	3915
C-2	8287	4144
C#2	8779	4390
D-2	9309	4655
D#2	9852	4926
E-2	10463	5232
F-2	11084	5542
F#2	11745	5873
G-2	12445	6223
G#2	13185	6593
A-2	13964	6982
A#2	14779	7390
B-2	15694	7847
C-3	16574	8287
C#3	17559	8780
D-3	18668	9334
D#3	19705	9853
E-3	20864	10432
F-3	22168	11084
F#3	23489	11745
G-3	24803	12402
G#3	26273	13137
A-3	27928	13964
A#3	29557	14779
B-3	31388	15694

Tables ProTracker note frequencies (PAL)

Fine Tune: -1

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	4115	2058
C#1	4357	2179
D-1	4618	2309
D#1	4892	2446
E-1	5186	2593
F-1	5491	2746
F#1	5815	2908
G-1	6169	3085
G#1	6532	3266
A-1	6914	3457
A#1	7328	3664
B-1	7761	3881
C-2	8229	4115
C#2	8715	4358
D-2	9237	4619
D#2	9771	4886
E-2	10371	5186
F-2	10981	5491
F#2	11629	5815
G-2	12316	6158
G#2	13040	6520
A-2	13855	6928
A#2	14657	7329
B-2	15557	7779
C-3	16421	8211
C#3	17472	8736
D-3	18473	9237
D#3	19596	9798
E-3	20742	10371
F-3	22030	11015
F#3	23335	11668
G-3	24631	12316
G#3	26080	13040
A-3	27710	13855
A#3	29313	14657
B-3	31113	15557

Fine Tune: -2

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	4086	2043
C#1	4325	2163
D-1	4583	2292
D#1	4859	2430
E-1	5148	2574
F-1	5448	2724
F#1	5777	2889
G-1	6115	3058
G#1	6484	3242
A-1	6874	3437
A#1	7283	3642
B-1	7711	3856
C-2	8173	4087
C#2	8651	4326
D-2	9165	4583
D#2	9718	4859
E-2	10281	5141
F-2	10914	5457
F#2	11553	5777
G-2	12231	6116
G#2	12945	6473
A-2	13748	6874
A#2	14536	7268
B-2	15421	7711
C-3	16345	8173
C#3	17302	8651
D-3	18378	9189
D#3	19382	9691
E-3	20621	10311
F-3	21760	10880
F#3	23032	11516
G-3	24461	12231
G#3	25890	12945
A-3	27495	13748
A#3	29073	14537
B-3	30843	15422

Fine Tune: -3

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	4054	2027
C#1	4294	2147
D-1	4553	2277
D#1	4819	2410
E-1	5111	2556
F-1	5415	2708
F#1	5730	2865
G-1	6073	3037
G#1	6437	3219
A-1	6821	3411
A#1	7224	3612
B-1	7661	3831
C-2	8116	4058
C#2	8588	4294
D-2	9095	4548
D#2	9638	4819
E-2	10222	5111
F-2	10814	5407
F#2	11479	5740
G-2	12147	6074
G#2	12851	6426
A-2	13642	6821
A#2	14477	7239
B-2	15288	7644
C-3	16196	8098
C#3	17218	8609
D-3	18189	9095
D#3	19277	9639
E-3	20384	10192
F-3	21627	10814
F#3	22883	11442
G-3	24294	12147
G#3	25702	12851
A-3	27284	13642
A#3	28837	14419
B-3	30577	15289

Fine Tune: -4

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	4026	2013
C#1	4263	2132
D-1	4518	2259
D#1	4787	2394
E-1	5074	2537
F-1	5374	2687
F#1	5693	2847
G-1	6032	3016
G#1	6391	3196
A-1	6769	3385
A#1	7180	3590
B-1	7595	3798
C-2	8043	4022
C#2	8526	4263
D-2	9048	4524
D#2	9586	4793
E-2	10134	5067
F-2	10748	5374
F#2	11368	5684
G-2	12064	6032
G#2	12759	6380
A-2	13538	6769
A#2	14360	7180
B-2	15223	7612
C-3	16122	8061
C#3	17052	8526
D-3	18096	9048
D#3	19172	9586
E-3	20268	10134
F-3	21496	10748
F#3	22737	11369
G-3	24129	12065
G#3	25517	12759
A-3	27076	13538
A#3	28837	14419
B-3	30315	15158

Tables ProTracker note frequencies (PAL)

Fine Tune: -5

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	3999	2000
C#1	4233	2117
D-1	4484	2242
D#1	4755	2378
E-1	5038	2519
F-1	5334	2667
F#1	5648	2824
G-1	5991	2996
G#1	6345	3173
A-1	6718	3359
A#1	7122	3561
B-1	7547	3774
C-2	7989	3995
C#2	8465	4233
D-2	8979	4490
D#2	9509	4755
E-2	10076	5038
F-2	10683	5342
F#2	11296	5648
G-2	11983	5992
G#2	12667	6334
A-2	13435	6718
A#2	14245	7123
B-2	15093	7547
C-3	15977	7989
C#3	16971	8486
D-3	17914	8957
D#3	18967	9484
E-3	20153	10077
F-3	21367	10684
F#3	22592	11296
G-3	23966	11983
G#3	25335	12668
A-3	26870	13435
A#3	28375	14188
B-3	30058	15029

Fine Tune: -6

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	3967	1984
C#1	4202	2101
D-1	4456	2228
D#1	4717	2359
E-1	5003	2502
F-1	5294	2647
F#1	5612	2806
G-1	5941	2971
G#1	6300	3150
A-1	6667	3334
A#1	7066	3533
B-1	7483	3742
C-2	7935	3968
C#2	8405	4203
D-2	8912	4456
D#2	9433	4717
E-2	9991	4996
F-2	10588	5294
F#2	11224	5612
G-2	11902	5951
G#2	12578	6289
A-2	13334	6667
A#2	14131	7066
B-2	14966	7483
C-3	15905	7953
C#3	16810	8405
D-3	17824	8912
D#3	18866	9433
E-3	20039	10020
F-3	21239	10620
F#3	22449	11225
G-3	23805	11903
G#3	25155	12578
A-3	26668	13334
A#3	28375	14188
B-3	30058	15029

Fine Tune: -7

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	3941	1971
C#1	4173	2087
D-1	4423	2212
D#1	4685	2343
E-1	4961	2481
F-1	5255	2628
F#1	5577	2789
G-1	5902	2951
G#1	6256	3128
A-1	6630	3315
A#1	7024	3512
B-1	7436	3718
C-2	7882	3941
C#2	8346	4173
D-2	8845	4423
D#2	9359	4680
E-2	9935	4968
F-2	10525	5263
F#2	11154	5577
G-2	11823	5912
G#2	12489	6245
A-2	13235	6618
A#2	14019	7010
B-2	14903	7452
C-3	15764	7882
C#3	16731	8366
D-3	17734	8867
D#3	18767	9384
E-3	19815	9908
F-3	20988	10494
F#3	22308	11154
G-3	23646	11823
G#3	24978	12489
A-3	26469	13235
A#3	28150	14075
B-3	29806	14903

Fine Tune: -8

Note	Sample Rate (Hz)	Nyquist (Hz)
C-1	3911	1956
C#1	4144	2072
D-1	4390	2195
D#1	4655	2328
E-1	4926	2463
F-1	5231	2616
F#1	5542	2771
G-1	5872	2936
G#1	6223	3112
A-1	6593	3297
A#1	6982	3491
B-1	7389	3695
C-2	7830	3915
C#2	8287	4144
D-2	8779	4390
D#2	9309	4655
E-2	9852	4926
F-2	10463	5232
F#2	11084	5542
G-2	11745	5873
G#2	12445	6223
A-2	13185	6593
A#2	13964	6982
B-2	14779	7390
C-3	15694	7847
C#3	16574	8287
D-3	17559	8780
D#3	18668	9334
E-3	19705	9853
F-3	20864	10432
F#3	22168	11084
G-3	23489	11745
G#3	24803	12402
A-3	26273	13137
A#3	27928	13964
B-3	29557	14779