CASSETTE

1 . 0 . 2

INTRODUCTION

Cassette is a tape emulation audio plug-in based on the sound of several cassette tapes and decks.

Cassette has been carefully modelled after exhaustive analysis of several tape types (I, II, III and IV) and cassette recorders/players: Tascam 414 (Pro) and Omega Reporter-20 (Micro). We've included a third deck named "Home" which is a combination of the Pro and Micro decks.

Magnetic tape is not a sterile media and cassettes are no different. It will impart its own signature to signals recorded into it. These include frequency dependent saturation, high-frequency compression, frequency response, hiss, asperity noise and much more. Reproduction systems will also induce some of their sound fingerprint like wow and flutter, random frequency loss, crosstalk between channels, stereo unbalances and other. These little quirks and random fluctuations imprint instant character, movement and analog feel all around in its path.

This is **not** a high fidelity plug-in! Cassette is designed to **be fun.**

Cassette offers a carefully chosen set of parameters:
‣ Input gain.
‣ Output gain.
‣ Tape type.
‣ Deck type.
‣ Erasures.
‣ Spread.
‣ Stability.
‣ Static noise.
‣ Dynamic noise.
‣ Artifacts.
‣ Frequency response.
‣ Saturation.
‣ Compression.
‣ Noise auto-mute.
‣ Oversampling.
‣ Crosstalk.
‣ Azimuth.
‣ Intermodulation.
‣ Re-Cassette.
‣ Mix.
‣ Wow depth.
‣ Wow rate.
‣ Flutter depth.
‣ Flutter rate.
‣ Stability randomness.
‣ Degradation depth.
‣ Degradation rate.
‣ Dropouts depth.
‣ Dropouts rate.
‣ Random snap.

Now you may be asking: why? The answer is: because...

we.
love.
cassettes.

GETTING STARTED

SPECIFICATIONS

- Cassette emulation.
- 4 tape types.
- 3 decks.
- Set of parameters to control every detail.
- HQ oversampling.
- Preset system.
- Resizable GUI.
- Auto-updater.
- Formats: VST, VST3, AU, AAX (64 bit only).
- Platforms: OSX, Windows.

SYSTEM REQUIREMENTS

Mac OSX 10.7 or superior.
Windows 7 or superior.

INSTALLATION

MAC
Double-click on the PKG file downloaded from Wavesfactory.
Follow the steps to install the plugin.

The installer will place the different plugin formats in the right folders for you:
- **AU**: Library/Audio/Plug-Ins/Components/Cassette.component
- **VST**: Library/Audio/Plug-Ins/VST/Cassette.vst
- **VST3**: Library/Audio/Plug-Ins/VST3/Cassette.vst3
- **AAX**: Library/Application Support/Avid/Audio/Plug-Ins/Cassette.aaxplugin

The installer will also create a folder in Library/Application Support/Wavesfactory named Cassette that will contain all the necessary files like presets, user manual and license.

WINDOWS
Double-click on the EXE file downloaded from Wavesfactory.
Follow the steps to install the plugin.

The installer will place the different plugin formats in the right folders for you:
- **VST 64 bit**: C:\Program Files\Steinberg\Vstplugins\
- **VST3 64 bit**: C:\Program Files\Common Files\VST3\
- **AAX 64 bit**: C:\Program Files\Common Files\Avid\Audio\Plug-Ins

The installer will also create a folder at C:\Users\'username'\AppData\Wavesfactory named Cassette that will contain all the necessary files like presets, user manual and license.

TROUBLESHOOTHING

If Cassette doesn't appear in your DAW plug-in list you can try following steps:

‣ Re-scan all plug-ins.
‣ If you're on Windows make sure that the plug-in is in the correct folder as the installer will place it in the default VST location and your DAW may be using a custom one.
‣ Make sure that your OS version is 10.7 minimum on Mac and Windows 7 minimum on Windows.

If Cassette crashes your DAW on start-up or while using it please delete it from the folder and reinstall it.
Make sure that you have the latest version by downloading the installer from the website:
https://www.wavesfactory.com/cassette

If the crashes continue, contact support with any available crash reports, specifying your OS version, DAW version and any other valuable information that you may have.
https://www.wavesfactory.com/contact

DEMO EVALUATION

Cassette will run in demo mode by default. It will output a 2-seconds volume dip every 60 seconds, parameters won't be recalled when saving the session and preset saving is disabled. All other features will be available for full evaluation with no specific time expiration.
While in demo mode the plugin will show the authorisation panel every time you open the UI, if you still want to evaluate it you have to click on "Continue evaluation" at the bottom of the pop-up.

AUTHORISATION

When purchasing Cassette from Wavesfactory you'll receive an e-mail containing the username and serial number formatted like this:

Username: john@doe.com
Serial: 1234567890987654321

You have to copy this to the clipboard by selecting it and either:
‣ Right-click and select "copy".
‣ Press Ctrl + C on Windows or Cmd + C on Mac.

Important: Make sure that you copy them without empty spaces as it will result in a not valid authorisation.

Then, open the plug-in and the authorisation panel will appear. Insert your username and serial. Press the "paste" button and the contents of the clipboard will be copied accordingly. Finally, press the Activate button. If the information is correct he plug-in will save your serial number in Wavesfactory/Cassette/License. If the information is not correct the panel will
In order to de-authorise you can simply delete the file inside Wavesfactory/Cassette/License.
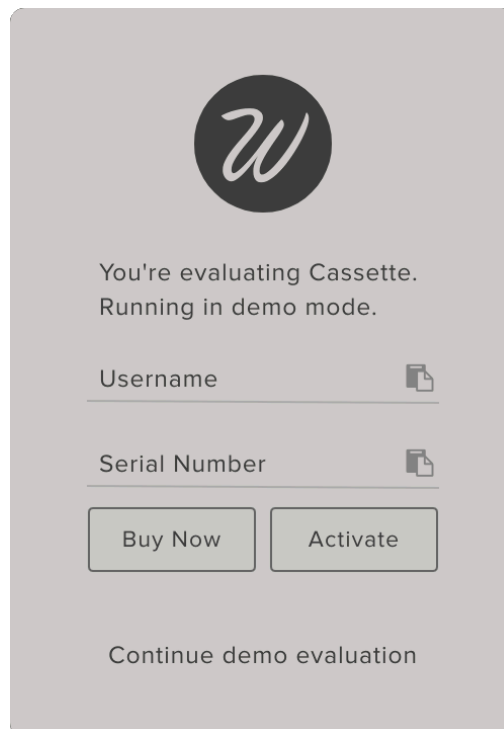
PARAMETERS

▸ **Input** - ranges from -24dB to +24dB.
This parameter sets the gain of the input signal. This gain is **compensated** automatically under the hood after all the process is done. This way, you can drive the algorithm without any volume changes. Increasing the input signal will result in more saturation, more high frequency attenuation, more compression and less noise. Decreasing the input signal will result in less saturation, more high frequency, less compression and more noise.

▸ **Output** - ranges from -24dB to +24dB.
This parameters controls the volume of the output signal.

▸ **Tape type**
Select between the four available tape types: Type I, Type II, Type III and Type IV.
Changing tapes will result in a different frequency response, different hiss (static noise), different asperity noise (dynamic noise), different saturation and different compression.

▸ **Deck type**
Select between the three available deck types: Pro, Home and Micro. Pro is a Tascam 414 four-c recorder. Micro is an Omega Reporter-20 hand recorder. The big difference between the Tascam and the Omega leaves room for a mix between the two, we call it "Home".
Changing decks will result in a different frequency response, different saturation, different compression, different hiss (static noise) and different asperity noise (dynamic noise).

▸ **Erasures** - ranges from 1x to 20x.
We have also measured the difference between a brand new tape and a one that has been overwritten 20 times. The results were very interesting and unexpected. In the Tascam (Pro deck) there was no audible difference (good job, Tascam!). Results from the Omega (Micro deck) showed a big difference in frequency response. That difference was modelled and you can control it with the erasures knob regardless of the deck chosen.

▸ **Spread** - ranges from mono to 100% stereo.
This knob controls the amount of stereo field.

▸ **Stability** - ranges from 0% to 100%.
This parameter controls the amount of wow and flutter. When it's at 100% stability there will be no pitch fluctuations. At 0% (or full instability) the wow and flutter amount will be 100% controlled from the "wow depth" and "flutter depth" parameters in the settings panel.

▸ **Static noise** - ranges from -96dB to 0dB.
Also known as hiss, it's the noise floor of tape recording caused by the random orientation of the magnetic particles. The amount of hiss can be controlled with this knob but it's also dependant of the input parameter. Less input signal results in more noise. More input signal results in less noise.

▸ **Dynamic noise** - ranges from -96dB to 0dB.
Also known as 'asperity noise'. It's caused by small imperfections in the surface of magnetic tape. This results in a frequency-dependant stereo noise that can make a track sound wider. It's also referred to as '3D effect' and it can make mono sources feel stereo.

▸ **Artifacts** - ranges from 0% to 100%.
This knob controls the amount of degradation and dropouts. Degradation (or wear) is random high frequency loss at a slow rate. Dropouts is random frequency loss at a high rate. If the Artifacts knob is set to maximum, the amount of degradation and dropouts will be totally controlled from the degradation depth and dropouts depth parameters found in the settings panel.

▸ **Frequency response**

This switch enables/disables the frequency response of each deck and cassette type. This frequency response is dynamic and reacts to the level of the signal, as observed in our analysis.

▸ **Saturation**

This switch enables/disables the tape saturation. This saturation was accurately modelled using a proprietary method for extracting the frequency dependence of each tape type.

▸ **Compression**

This switch enables/disables the tape compression.

▸ **Noise auto-mute**

By default, static noise (or hiss) will stop as soon as no signal is detected. If this switch is enabled, the noise will be permanent and won't stop even if the playback from your DAW stops.

▸ **Oversampling**

Oversampling is mandatory on all plug-ins that introduce extra harmonics (don't trust saturation plug-ins that don't perform oversampling). Cassette will intelligently apply different oversampling ratios depending on your sample rate. The plug-in will always work internally at 192KHz sampling rate.

▸ **Crosstalk** - ranges from -96dB to 0dB.

Crosstalk is signal leaking from one channel to the other. The signal we measured was always at -30dB but with this knob you can set the amount of crosstalk that you want. Since the signal leaked is not 'flat' this may result also in a 3D effect, and since it will reduce the stereo width specially on high frequencies it helps glueing the track together.

▸ **Azimuth** - ranges from -100% to +100%.

Azimuth is the use of a variation in angle between two recording heads. Normally, the head is perpendicular to the movement of the tape, this is considered zero degrees. However, if the heads are mounted at slightly different angles, destructive interference will occur at high frequencies resulting in comb filtering. It will also have an effect on 'precedence' since one channel will be slightly delayed.

▸ **Intermodulation** - ranges from 0% to 0.01%

In our tests we saw some effects that weren't expected. This is one of them. Intermodulation is a non-linear effect produced when modulating the amplitude of a signal with another signal. This results in extra harmonics at both sides of the frequency being modulated. This is usually an effect that you'd want to avoi, but since we wanted to accurately emulate the whole cassette response we included it. Of course, you can turn it off.

▸ **Re-Cassette** - ranges from 1x to 4x.

Re-Cassette is a parameter that is effectively like having a set of Cassette plug-ins stacked. If the amount of this slider is 4x it will be like recording the output of the cassette into another cassette and repeat that process 4 times. Everything gets exaggerated. More saturation, more fluctuations, more of everything and also more CPU! Handle with care.

▸ **Mix** - ranges from 0% to 100%.

"All plug-ins should have a mix parameter" someone said. I believe this is not true for tape emulation plug-ins, but in this case I loved how the mix between dry and the wet signals created that special flanger effect.

▸ **Wow depth** - ranges from 0% to 100%.

This parameter controls the amount of wow (slow sinusoidal pitch fluctuations). This parameter is weighted by the "Stability" parameter in the main GUI.

‣ **Wow rate** - ranges from 0.5Hz to 5Hz
This parameter controls the frequency of the wow LFO.

‣ **Flutter depth** - ranges from 0% to 100%.
This parameter controls the amount of flutter (rapid sinusoidal pitch fluctuations). This parameter is weighted by the "Stability" parameter in the main GUI.

‣ **Flutter rate** - ranges from 8Hz to 20Hz.
This parameter controls the frequency of the flutter LFO.

‣ **Stability randomness** - ranges from 0% to 100%.
When analysing the wow and flutter components of analog cassette tape recordings we realised that there was a random component to them, as opposed to a perfect sinusoidal waveform like the vast majority of plug-ins have. That's true for the Tascam deck, and more explicitly for the Omega recorder in which the flutter was dominant and almost completely random. This parameter sets the amount of randomness of the wow and flutter signals, and it's also affected by the wow and flutter rate.

‣ **Degradation depth** - ranges from 0% to 100%.
Also known as 'wear', this effect was predominant in the Omega recorder (Micro deck). Random errors in the magnetic particles affect the high frequency response of the tape. This parameter controls the amount of effect and it's weighted by the 'Artifacts' parameter in the main UI.

‣ **Degradation rate** - ranges from 0.5Hz to 3Hz.
This parameter controls the frequency of the random LFO that drives the degradation effect.

‣ **Dropouts depth** - ranges from 0% to 100%.
Similar to the degradation (or wear), but faster. This is also a randomised effect caused by errors or little damages in the tape causing high frequency loss. This parameter controls the amount of effect and it's also weighted by the 'Artifacts' parameter in the main UI.

‣ **Dropouts rate** - ranges from 8Hz to 20Hz.
This parameter controls the frequency of the random LFO that drives the dropouts effect.

‣ **Random snap** - ranges from 0% to 100%.
Sometimes it happens. The tape gets stuck for an instant making the pitch drop, then it gets liberated and quickly goes to normal speed making the pitch raise. These little quirks were modelled and this parameter sets how likely are them to happen.

TAPE TYPES

Cassette tapes are made of a polyester-type plastic with a magnetic coating. Different magnetic materials were used during the years, each one of them bringing different characteristics like frequency response or saturation.

In the plug-in we have modelled the four different cassette types available:

TYPE I

Type I normal bias audio cassette was the standard and most compatible tape format. The tape preserved sound by means of a **ferric-oxide** (Fe_2O_3) coating, and first appeared in the consumer market in the mid 1960s.

TYPE II

The Type II high bias audio cassette with a **chromium dioxide** (CrO_2) tape formulation was introduced at the dawn of the 1970s. Featured an undeniable increase in high frequency response over the often muffled tone of the existing Type I ferric cassette. This meant much better definition.

TYPE III

Living in a fairly obscure life for a relatively short period between the mid 1970s and the early 1980s, the **ferro-chrome** (Fe-Cr) was the format that never really made it into the golden era of the compact cassettes.

TYPE IV

The metal-formulated audio cassette hit the scene near the en of the 1970s, as the answer to a number of problems with previous tape formulations. This was a very hard-wearing tape, which could take much higher sound levels than a chrome, whilst reproducing equal or better high frequency definition and firmer bass.

USER INTERFACE

MAIN

Cassette's interface has been designed to be easy and quick to get the sound you're looking for, but it also gives you the tools to go deeper.
We placed a set of knobs that we think that are the most important ones in the main GUI: tape and deck selectors, input and output gain, erasures, spread, stability, static noise, dynamic noise and artifacts.

You can also see the input and output meters above the correspondent input and output knobs.
By clicking on the right and left arrow on the sides of the cassette art you'll be changing the tape type. Just below that cassette you'll find the three switches that let you choose between the three different cassette decks.

In the top left you can see our logo, that will display the Cassette info panel when clicked. At the centre you can see the presets box with navigation arrows for easy switching. And at the top right you can see two icons. The 'cog' icon toggles the settings panel and the 'burger menu' icon toggles the main menu. More on that later.

At the bottom right corner you'll see the icon indicating that the whole GUI is resizable. Just drag to resize. The plug-in will remember it's size and it can always be reset by clicking on the main menu and selecting "Default size".

SETTINGS PANEL
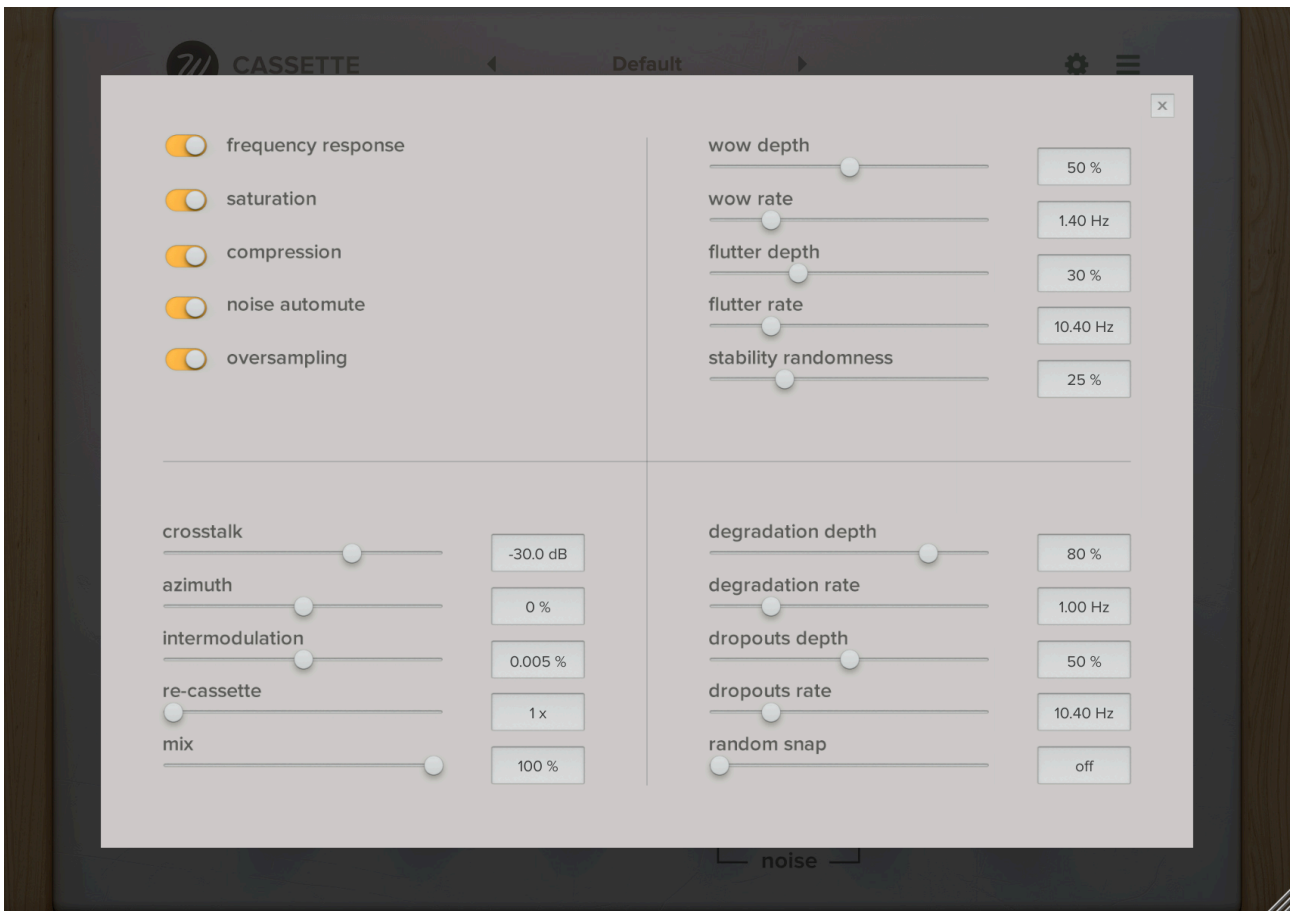
The settings panel consists of four sections:

‣ **Top left**: Tape section.
‣ **Top right**: Stability section.
‣ **Bottom left**: More section.
‣ **Bottom right**: Artifacts section.

Here you can control the extra details of the tape emulation process.
In 'tape section' you can toggle on or off the different tape characteristics. I've always wanted to be able to control how a plug-in works internally in a modular way being able to disable different parts of the process.

Everything is self-explanatory. The important part to understand here is that the Stability section won't be of any effect if the 'Stability' parameter in the main GUI is set to '100%', and that the Artifacts section won't be of any effect if the 'Artifacts' parameter in the main GUI is set to 'off'.

In order to close this panel you can either click on the icon in the top right of the panel or directly click outside of the panel in the black area.

MAIN MENU
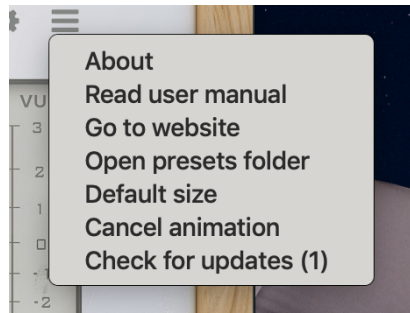
The menu on the top right contains these elements:

- **About**: this will open a pop-up panel that shows the version number and credits.
- **Read user manual**: the folder containing the user manual will be opened.
- **Go to website**: this will launch https://www.wavesfactory.com/cassette in your default browser.
- **Open presets folder**: it will open the presets folder so you can manage the preset structure.
- **Default size**: selecting this option will reset the plug-in to the default size of 850x600 pixels.
- **Cancel animation**: this item will stop the animation. Useful to save some CPU. You can replay it later if you want.

Extra:
If an update is available the menu will also feature an option named "Check for updates (1)". More on that in the next chapter.

AUTO-UPDATER

In order to make the plug-in easier to use and improve the user experience we've included a new method for updating it. Rather than sending an e-mail for letting you know that there is an update and tell you to go to the website and download it, we've thought of a better method.

The plug-in itself will warn you that there is an update available by displaying a yellow icon in the top right of the main GUI.

This icon will only appear if your computer is connected to the internet and if it's possible to perform the update.

When clicking on this yellow update icon this panel will appear:
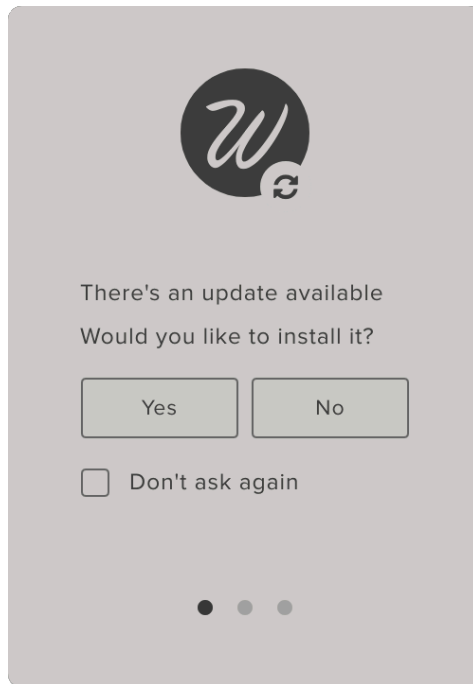
If you don't want to install the update you can postpose it by clicking "No".
If you don't even want the plug-in to warn you again you can toggle the "Don't ask again" switch.
Then, the icon will disappear but a new option will appear in the main menu named "Check for updates (1)". This menu option will trigger the same process as the yellow update icon.
If you would like to perform the update (always recommended!) you have to click on "Yes".
The plug-in will ask you where you want to download the installer in your hard drive using a native window. In this case, in a macOS system.
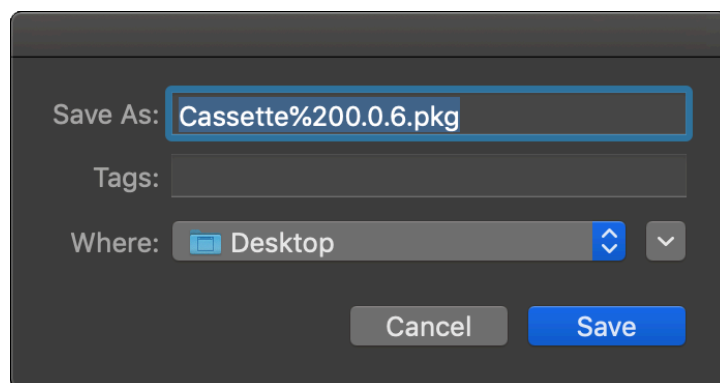
If you click on "Cancel" or if something goes wrong, an error message will appear indicating that there has been an error and you should try again.
If a valid location has been set, the download will begin.
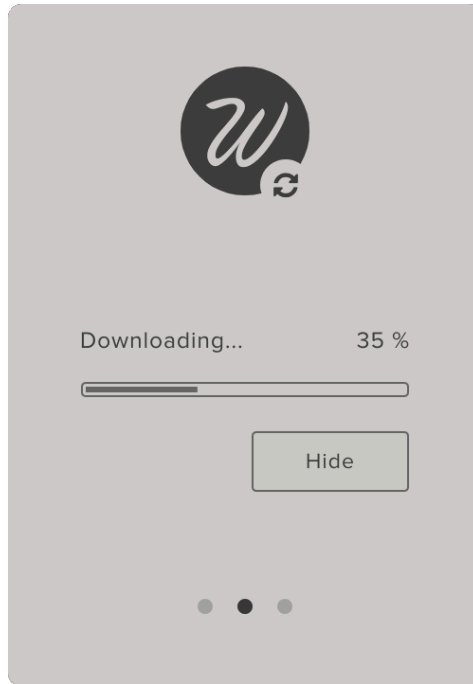
In this window you can see the download progress. Here we depend on the server speed and your own connection speed. Usually, it should be fine and the download should be ready in 1 minute (the installer's size is roughly 100MB).
You can always click on "Hide" so the plug-in downloads the installer in the background while you work in the main interface.

Once the download finishes the plug-in will launch the installer automatically, you should install the plug-in normally. Then, this message will appear.
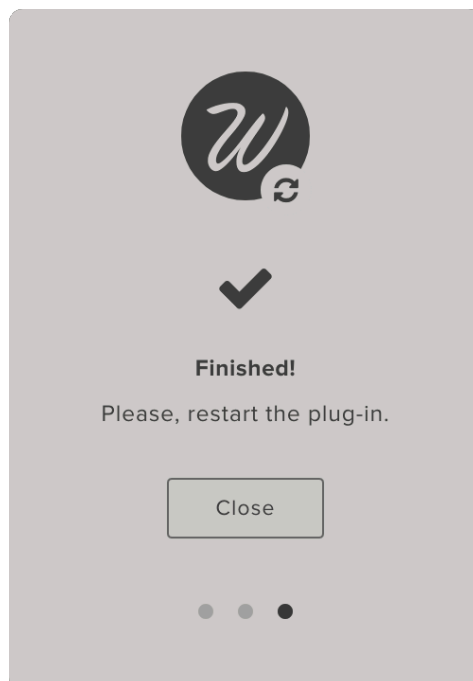
Then, as you can read in the window, you should relaunch the plug-in and everything should be updated.

PRESETS

ABOUT

At the top centre of the plug-in you'll find the presets menu. It will be set to the "default" preset when you open the plug-in for the first time. It works like a regular preset manager where you have a list that it lets you pick any item and all parameters will be changed accordingly.
The presets are stored in .wfp (Wavesfactory Preset) format in:
‣ **Mac**: Library/Application Support/Wavesfactory/Cassette/Presets
‣ **Windows**: C:\Users\'username'\AppData\Wavesfactory/Cassette/Presets

You can directly manage the presets in this folder, if you create different sub-folders for drums, bass, guitars, mastering, each containing a set of presets, Cassette will take care of that structure and will show it accordingly using sub-menus.

To open the presets folder you can simply click on the top right menu and select "Open presets folder".

SAVE / LOAD / DELETE

The first three elements in the presets menu are: Default, Save and Save As.
Select the default preset for going back to the initial state. This default preset can't be changed or re-saved.

In order to save a new preset you first have to tweak the parameters to your taste, then open the presets menu and select "Save As". This will open a native OS window that will let you name the preset and save it in the presets folder.

When you have a preset loaded and you tweak it, the Save label will appear with an asterisk like this: Save*. This means that the preset has been modified and you can save it directly without going through the "Save As" dialog.

If you want to save a new preset based on a saved one you can select "Save As" and the save dialog will appear.
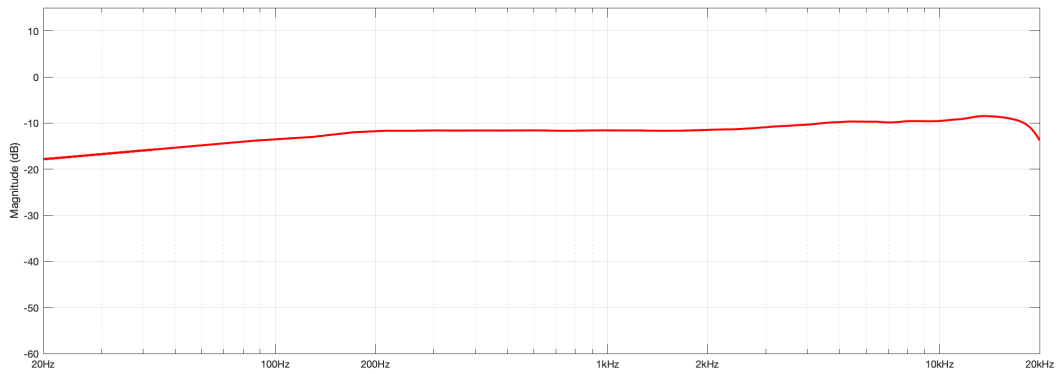
Deleting a preset is as easy as deleting a file in your computer. Open the presets folder with the Cassette menu and re-arrange or delete any presets you want.
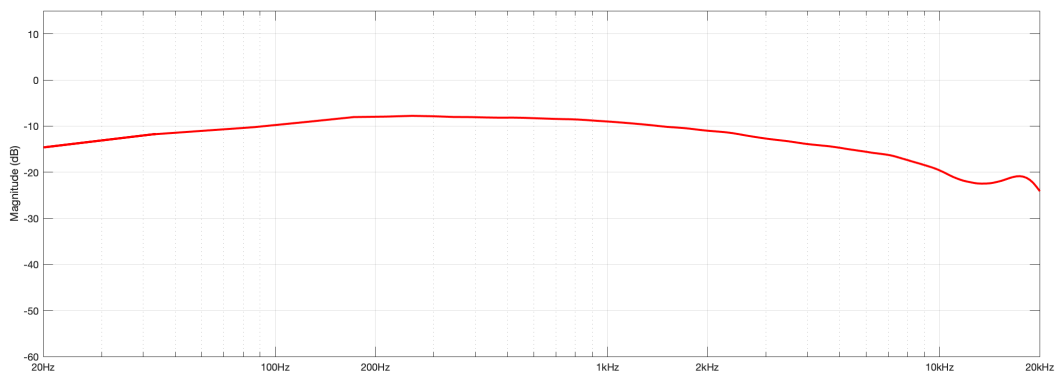
FREQUENCY RESPONSE PLOTS

For reference, these are the frequency response of all the cassette types and decks:
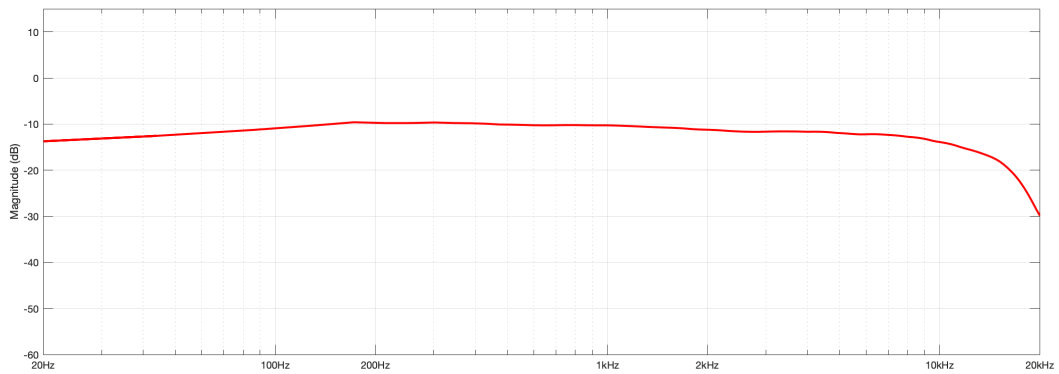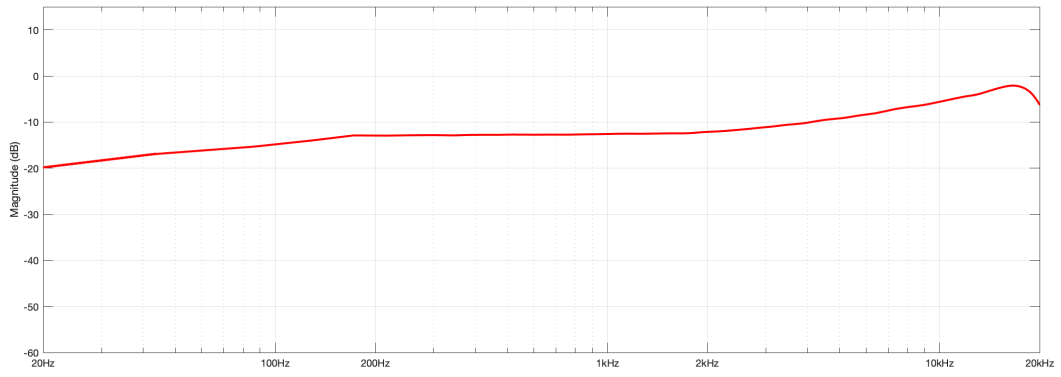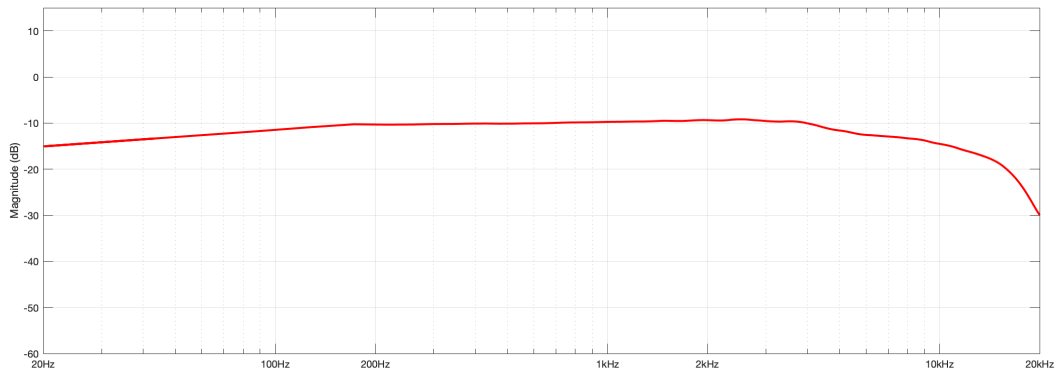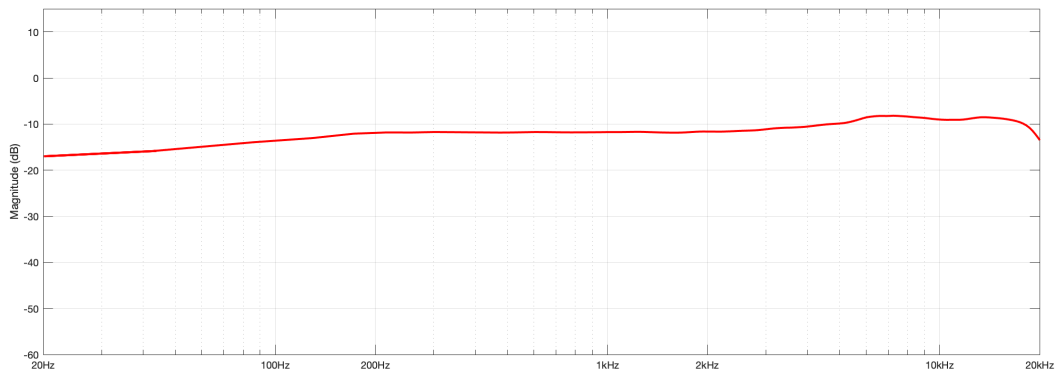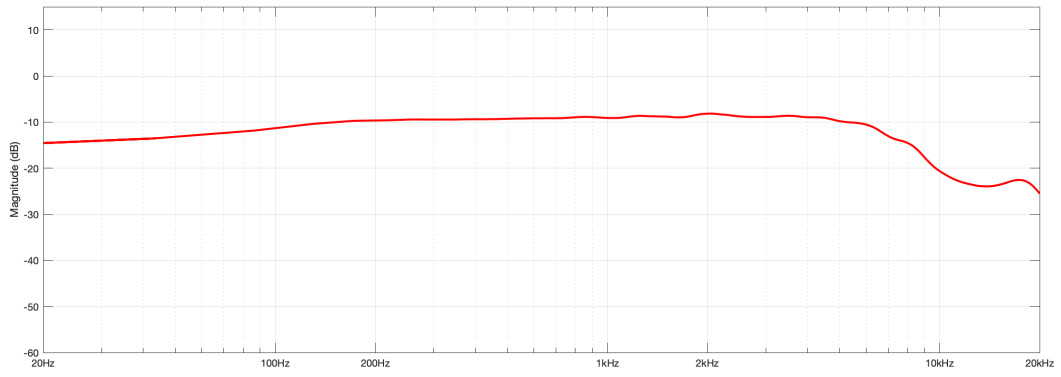

Pro - Type I
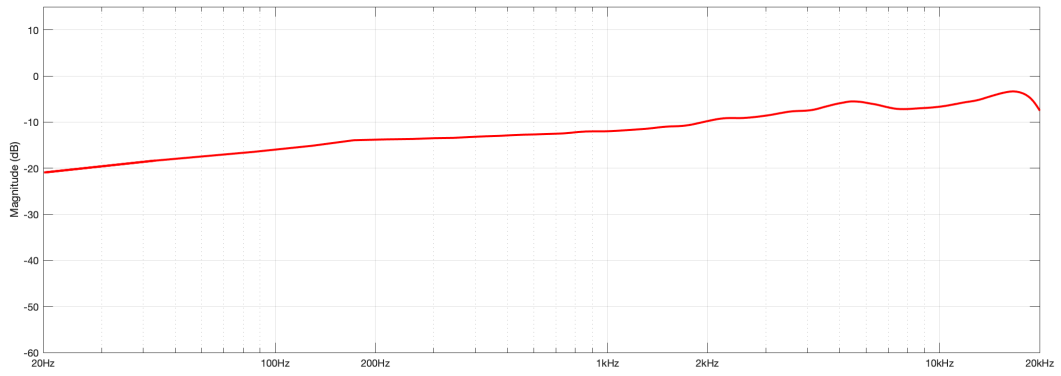

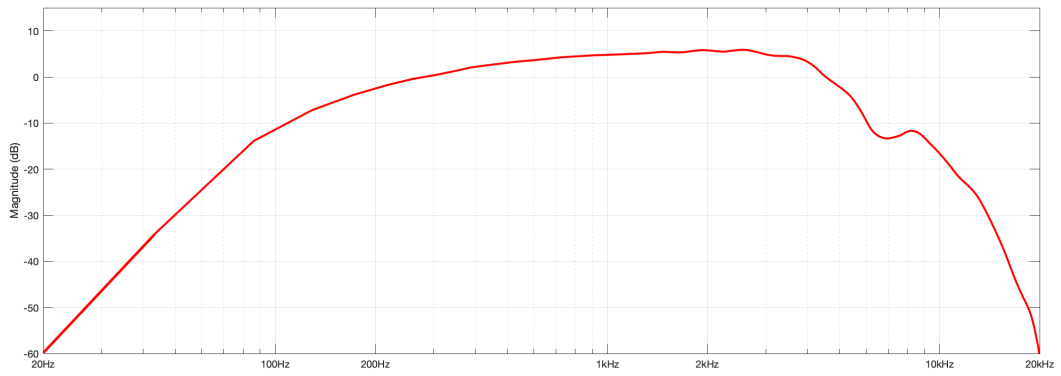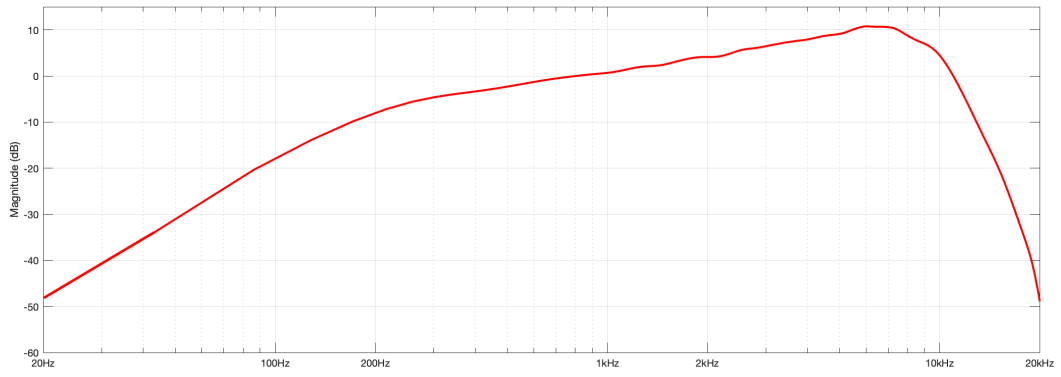Pro - Type II

Pro - Type III
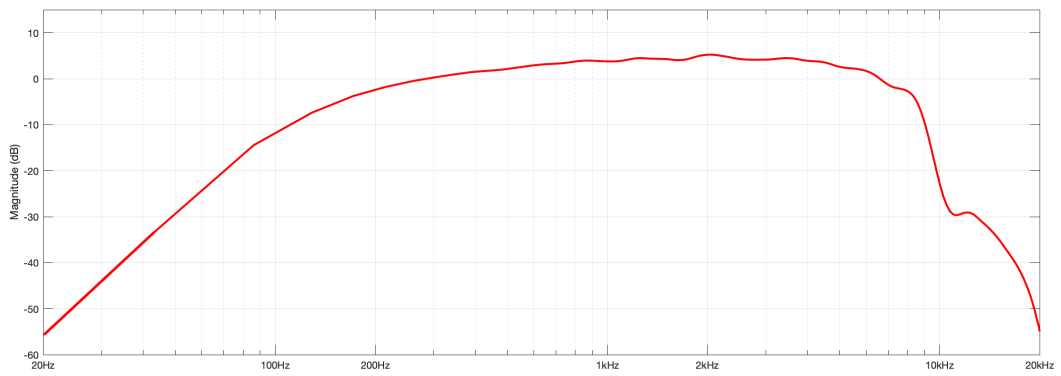
Pro - Type IV

Home - Type I
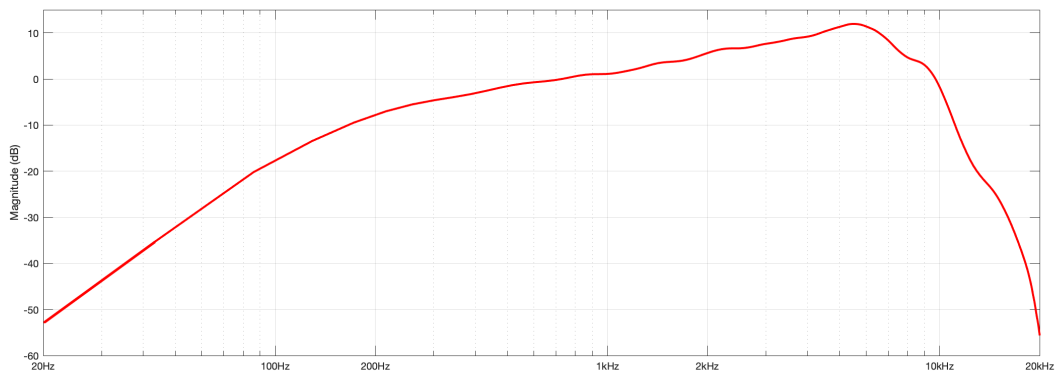

Home - Type II

Home - Type III

Home - Type IV

Micro - Type I

Micro - Type II

Micro - Type III

Micro - Type IV

SUPPORT

If you find any bug or you have any questions please get in contact with us following this link:
https://www.wavesfactory.com/contact

FINAL WORDS

A huge thanks to all people involved in this project. Beta testers, video makers, reviewers, artists, designers, composer friends and coding friends!
We hope you like it as much as we do and it helps you take your mixes to the next level.

Thank you very much for supporting Wavesfactory.

CREDITS

- ▸ **Production**: Wavesfactory.
- ▸ **Design**: Voger Design, Jesús Ginard, Pau Obrador.
- ▸ **DSP**: Jesús Ginard, Ivan Cohen.

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CHANGELOG

All bug-fixes, additions and all relevant changes made to Cassette will be documented here.

Version 1.0.2 - 19 / 11 / 2019
- Fixed: Pro/Home/Micro bug in Cubase and VST3.
- Improved: authorization process.
- Added: tape type and deck type automation.
- Added: Pro Tools key command automation.
- Added: artists presets from Insight.

Version 1.0.1 - 14 / 11 / 2019
- Fixed: Pro / Home / Micro buttons now respond to automation.
- Improved: settings sliders snap to mouse position on click.
- Added: Artists presets from Torley.

Version 1.0.0 - 04 / 11 / 2019
- Initial release.