

**apeDelay** - spectral Delay implements up to 2048 delay lines with feedback or up to 2048 Brick-wall filters. The algorithm is based on the STFT (i.e. Short Time Fourier Transform) analysis/re-synthesis. The audio signal is converted in abstract 'Frequency Domain', where is manipulated and transformed back again in 'Time Domain'. You can draw the Time and Feedback shapes for both stereo channels. This is achieved from the multi sliders, who provide a great tool to manage the huge numbers of parameters. You can also benefit of more advanced spectral manipulations like the Spectral Blur, Granulate, Bins Decimator, Noise Gate, Spectral Freeze and Brick-wall filters.

## Audio Unit Extension support

Since iOS 9 Apple introduced the Audio Unit V3 format which enables multiple instances of the same plug-in running at the same time.

You can load with compliant hosts like Apple's own GarageBand or other audio editing and mixing apps, compatible with the host-automations, host-save/load presets and host-save/load state in the session. The Audiounit Extension (i.e. AUv3) can share data only with the main App. The extension have two Manager called QuickSamples and QuickPresets for facilitate the audio/presets sharing. When you copy samples or preset banks, from/to, you will make a copy in a shared folder which is accessible from both.

### WARNING:


The memory limit imposed for AU Extensions on iOS is 300 MB for 32-bit devices and 360 MB on 64-bit devices.

These are performance considerations as you can expect from iOS devices having limited shared resources.


**We do not recommend loading more than 10 instances.**

### Sharing procedure:


1) From the AUv3 plugin open QuickSamples or QuickPresets Manager

2) Tap the 'Download icon'  this will launch the main app

3) From the main app, if you are importing an Audio Sample, tap one of them and chose 'Share with AUv3'. If you are importing a Preset Bank, select it

and tap the 'Share icon' 

4) Now you needs to coming back to the Host where you are running the AUv3 plugin, double tap on the iDevice Home Button and select the app.

5) To complete the retrieve process you need to tap the 'Sync icon' 

## Tips & Tricks

- Double tap on the **Knobs** to show the options. In the **'Edit'** field you can enter the value from the keyboard. Tap **'Random'** to generate a random value, **'Default'** to reset to the factory settings and configure the knobs dragging behavior. Step fine resolution sets how many points of movement result in a one degree rotation in the knob's position. Only used in the horizontal/vertical slider modes. You can set Knobs behavior from Settings.
- Long Press Tap on the **Toggles** to open Control Manager Assignations.
- When the user presses the Home button, the app goes to the background process and will store the whole status of parameters to reload when next opening the app. See Settings for more explanations.
- apeDelay can play audio in the background and/or mix its own audio with other iOS apps. apeDelay also supports Apple IAA (i.e. Inter-App Audio for iOS 7 or higher) and Audiobus, so you can send and receive audio through applications.
- Swipe (right to left) on Preset, Presets Bank or Samples Manager (non built-in file) to delete.
- You can load Presets (current selected bank) by remotely sending a MIDI Program Change message. The channel listening is the same for the MIDI Note On/Off, You can configure this setting through 'Channel' in the MIDI Manager (see below for further details). The available range is 0 ÷ 127. A value of zero will select the first preset in the list, a value of 1 for the second etc... But no bank selection is supported yet.
- When you are connected in Audiobus or Inter-App Audio as FX, Input Mode will be selected automatically. Every time you will disconnect from AB or IAA, you will turn back in Sampler. A warning message will displayed be in order to prevent dangerous Speaker audio feedback. The same behaviour will occur if you have not attached, in your iPad/iPhone/iPod Touch, an external device as headset or Mic. etc... You can disable this message through the app Settings, see later for more explanations.
- We suggest you to disable the screen rotation, otherwise the accelerometer doesn't work properly.

- Double Tap on Brick-wall range selection (see later) to open Control Manager
- Long Press touch to Brick-wall range selection to restore full selection.
- **Init** will reset to default values, a reset message will be displayed.
- **Create Random Sound** values for all of the parameters including the FX parameters. The result can be very interesting and wayward.



Enable/Disable Accelerometer X/Y and LFO, see the Control Manager for more details.



Captures Output stereo signal (post Effects) and creates an audio file *wav* format 44.1 kHz 16 bit in the Documents Folder. Files created by *apeDelay* are saved with an id-name followed by a number, for example:

**Output Rec 1.wav, Output Rec 2.wav etc.**

Each new file will be numbered with the next consecutive number.



Sets the iDevice hardware **volume**.

## SYNC



The goal of SYNC is to setup a global Metronome (MASTER BPM). This will affect the LFO (Low Frequency Oscillator) and/or the Sequencer when its enabled to receive the SYNC signal - see Control Manager for more details. The SYNC can be controlled remotely by MIDI Clock signal, or via Ableton Link.

You can adjust the BPM (Beats Per Minute) through the minus/plus buttons and these will replace the current value with the integer BPM (previous/next) or you can TAP to set your own Tempo. When the MIDI Clock is activated (see MIDI Manager), the 'MASTER BPM' slider will be disabled and the Tempo value is controlled by the MIDI Clock.

### Ableton Link description

Ableton Link is a new technology that synchronizes the beat, phase and tempo of Ableton Live and Link-enabled iOS apps over a wireless network. It lets you play devices together with the freedom of a live band. Anyone can start and stop their part while others keep playing, and anyone can adjust the

tempo and the rest will follow. You can use Link to play with several copies of Ableton Live, with Live and iOS apps, or with iOS apps together – even without Live in your setup.

By default 120 BPM corresponds to 1 Hz frequency for the LFOs.

The 'Sync' button waits for the next beat (Tempo Forte) from the MIDI Clock or Ableton Link and resets all phases for LFOs, Sequencer etc.

You can enable the MIDI Clock Signal by following these steps:

- 1 Open MIDI Manager
- 2 Send a MIDI Clock Signal
- 3 Enable the MIDI Clock for the chosen Source, see MIDI Manager for further information

## Sampler


You can feed *apeDelay* with a stereo sampler or stereo signal from microphone/line or Audiobus/Inter-App Audio when connected.

Touch and drag the waveform to scrub the audio file. The speed of the scrubbing is relative to the position of the finger inside the waveform: higher positions produce faster scrubbing



Tap the symbol to set the loop points. When in "loop edit mode" you can:

- tap and hold inside the selection for the fine regulation of the loop
- double tap inside the selection to select again the whole file

When a loop is set, deselect the (tap again ) to zoom-in into the loop selection.




Reset scanning to the start position.





Waveform Scrubbing Mode, when selected the pointer jumps to the **Absolute** position of the finger that touches the waveform. If unselected (**Relative**) it does not jump but the scrubbing occurs from Sampler position toward finger touch.



Load an audio sample, see Samples Manager for mode details.

 Include/exclude the Sampler state when Presets are loaded. The Sampler state is composed by File Path, Loop Points (Zoom), Play/Pause and selected Input Source. Please note even if it is disabled, the Sampler still saves its current state in the presets.

 Switches the Sampler Play function between Ratio and Time Signature mode. When in Ratio mode (blue icon) you can set the play ratio: 1 means play the sound file at the original speed, 0.5 means play at half speed, -0.5 means play at half speed and in reverse and so on. When in Time Signature mode (orange icon) you specify the number of Measures and Quarter per Measure the sound file contains, and the tempo is linked to the general Metronome Tempo; for instance if we specify 2 measures of 4 quarters each, and the general Tempo is 120 BPM, the sound file will be executed in 4 seconds.

 **BPM** The button appears only when the Sampler is in Time Signature mode (see above). If you tap the <-BPM button you overwrite the general Metronome Tempo with a tempo calculated using the sound file length and the Measures/Quartes setting. For instance, if the sound file length is 2 seconds, and it has 2 measures of 4 quarters each, the general Tempo is set to 240 bpm. This function is not available when the General Metronome is in SYNC mode (MIDI Clock or Ableton Link).

**N.B. You can disable the Crossfade and change Waveform style from the Settings.** See the Settings for more details.

## Input - Sampler Switch

You can choose between the internal sample player and a live input via Microphone, Audiobus or Inter-App-Audio.

### IMPORTANT NOTE:

When you are connected in Audiobus or Inter-App Audio as FX, Mic-AB-IAA will be selected automatically. Thus, every time you will disconnect from AB or IAA, you will turn back in Sampler. A warning message will be displayed in order to prevent dangerous Speaker audio feedback. The same behaviour will occur if you have not attached, in your iPad/iPhone/iPod Touch, an external device as headset or Mic. etc.

You can disable this message through the app Settings, see later for more explanations.

## Input Gain, Dry/Wet, Pan and Output Gain

“Input Gain” is the Sample/Input volume, Dry/Wet mixes the input sound with the aPeDelay sound, “Pan” puts it in the stereo continuum and “Output Gain” is the output volume.

### Multi-sliders overview

These frames can be considered as  $N$  sliders grouped, where  $N$  is depending from the FFT Size. For instance with an FFT Size of 2048 (default), we have ‘de facto’ 1024 (i.e.  $2048/2$ ) frequency bandwidth.

The Horizontal axis depicts the Frequencies while the Vertical is the weights. The frequency range is expressed from zero to Nyquist. The Nyquist frequency is the limit which we can process correctly into a digital system DSP (i.e. Digital Signal Processing). Example, with a Sampling Rate of 44.1 kHz (i.e. default 44100 Hz) the maximum Nyquist value is 22050 Hz. (i.e.  $44100/2$ ).

The FFT result (i.e. Fast Fourier Transform), is a fixed number of filter bands, spaced over Nyquist range. The distance between frequency bands is expressed by the RES value. This is calculated by dividing the Sample Rate for the real number of abstract filters (i.e.  $FFTSize/2$ ).

e.g.  $44.100/1024 = 43.06$  Hz.

This value is the Frequency Resolution (RES).

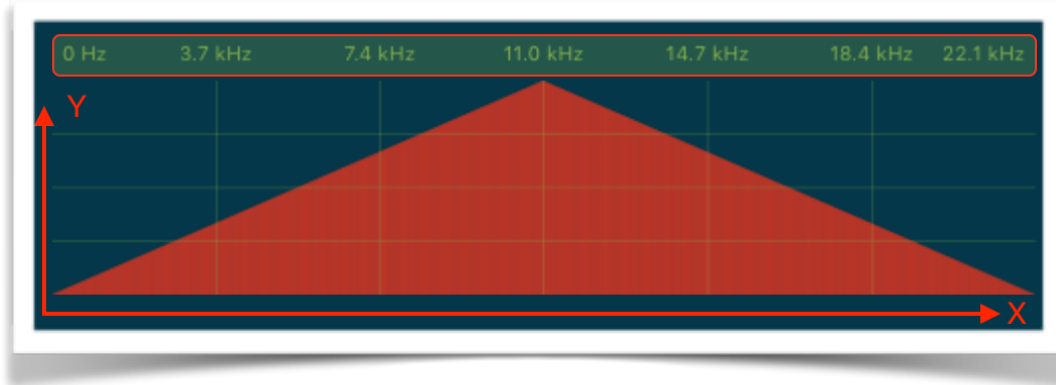
Example, with an FFT Size of 2048 points, we have 1024 sliders, spaced form:

**0, 43.06, 86.12, 129.18 ... Nyquist**

## Multi-sliders [DELAY TIMES]

This unipolar frame, can produce only positive values. The delay range is expressed from zero to (about) one second.

You can scale this value according to "Delay Amount" slider.



X = Frequency (0 ÷ Nyquist)

Y = Delay Time (0 ÷ 1 sec. ~)

## Multi-sliders [DELAY FEEDBACKS]

This is bipolar and it refers to the delay lines feedbacks gain. Negative values change the signal phase for the frequency band. Middle values (zero) means no Feedbacks gain.

X = Frequency (0 ÷ Nyquist)

Y = Feedback Gain (-1 ÷ 1), zero values means no feedback.

## Multi-sliders Shapes and Treatments

For all multi-sliders frames, there are some built-in shapes. You can drag & drop these on the Multi-sliders frames. The Treatments (on the right of the shapes) are self-explanatory, FLAT resets all value with zero, FLIP V and FLIP H for Vertical/Horizontal modifications. SHIFT to left the shape of 1/6 of the original. DIV redraws half shape and MULT redraws two times the current shape.

### Brick-wall Selection

Both Left and Right multi-sliders Delays, have a range selections, (on the top). These behave as a brick-wall filters and they are very selective since it operate on the FFT bins. You can modulate the selected region as a normal Knob (through the Control manager).

## Exponential/Logarithmic Frequency scale

Valid for only X-axis of left/right Multi-sliders for both mode Delay/Brickwall.  
This parameter will not affect the sound and the goal is to improve the sight of the Frequency range.

## Spectral Manipulations

The 'Decimator' parameter influence the FFT re-synthesis by skipping some bins according to Decimator amount.

The 'Granulate' parameter scale randomly the harmonics amplitudes of the FFT bins while the 'Spectral Blur' add a random value (+/-) to the pitch of FFT channels (bins). The 'Noise Gate' parameter sets a threshold for the FFT analysis bins and the 'Freeze' toggle keep hold recursively the last bin of FFT.

## Delay - Brickwall Switch

This switch commutates the operating mode in 'Brickwall filters'. In this way both 'Delay Multi-sliders' will change their color while will disabled the Multi-sliders Delays gain.



X = Frequency (0 ÷ Nyquist)

Y = Gain Time (0 ÷ 1)

The vertical range is the amplitude of each FFT bin expressed from zero to one. You can scale this value according to "Brickwall Amount" slider.



## Presets

Preset Manager will collect all the **Banks** (i.e. *.apeDelay suffix*) and **Snapshots**. A *Snapshot* is a simple “photo” of the parameters in the UI (i.e. User Interface). Both the Matrix and Keyboard/Sequencer are included but they can also be excluded, see the Settings for more details.

So, once you find an interesting sound you can take a snapshot (i.e. save this new preset) by touching the ‘plus’ icon and this new preset will be added to the selected Bank. The top four elements of the Snapshots list are assigned for ‘HV Snapshot Pad’, you can then sort or delete the Snapshots in the List by tapping the ‘List Icon’. You can even share the selected Bank and you can restore the factory Built-In Banks from the ‘Cloud’ icon, there is two options:

- 1) ‘Overwrite’ will erase all user presets that have been saved in the factory preset-banks and give you the unaltered factory preset-banks back;
- 2) ‘Merge’ will preserve the preset-banks which contain the user presets; If you created your own user preset-banks and saved presets there they will stay untouched.

Snapshot banks are located in Documents folder, you can access files via iTunes Sharing (see Add files to *apeDelay* through iTunes Sharing).



You can add new files by copying in the app's documents (through iTunes or from another app) and refresh the list from there.



Load a preset, randomly from the banks list.



Delete all Presets for a selected bank. A warning message will be displayed.

The Snapshots bank file is a kind of Property List format (*.apeDelay*), you can edit as text and modify the values just rename in *.plist*

Swipe (right to left) on Snapshots or Snapshots Bank, to delete.



The purpose of the unique **Snapshot Pad** is to obtain intermediate values between four snapshots (corners). You can change snapshots assigned in the corner through the Snapshots list (see above).

The Snapshots Pad performs complex interpolations between four snapshots on a two-dimensional space. By scrubbing your finger on the Snapshots Pad a temporary new snapshot will be created by mixing the four snapshots

depending on distance. Thus you can modify hundreds of parameters with a single touch, this is also called *Hyper Vectorial Synthesis*.

Snapshots Pad can be resized on fullscreen for detailed controls (left bottom icon).

**N.B. Snapshot Pad have no effect on Switches and Sampler.**

## Samples

Samples manager can read/write in the Documents folder, you can also share files through AudioCopy, Document Picker (iCloud, Dropbox etc...) and AudioShare. Samples manager can also read the Built-in files, but you cannot rename or delete them. Touch on a file in the list to show the actions popup. Here it is possible to **Load** a file in one of two Samplers (i.e. Sampler Ch.1 and Sampler Ch.2), Open In... contains all system actions over the file, according to file type. For example you can send files as an e-mail, open file with a listed app etc...



You can rename files in the Documents Folder, if you omit the file extension then Samples Manager will fill the original audio file extension for you. N.B. Samples manager shows only audio files supported, the other files in the Documents folder will not be seen.



You can pre-listen to the samples before you load them.



Starts audio capture from the microphone immediately and saves new stereo audio file in wav format 44.1 kHz, 16 bit in the Documents Folder. Files created are composed by id-name followed by a number, for example:

Input Rec 4.wav, Input Rec 5.wav etc...

Every new file will be numbered with the next consecutive number.

N.B. You can record a mono or stereo file in wav format 16 bit 44.1 kHz according to the iDevice channels. Even if the apeDelay is connected to Audiobus or IAA, the Grab Audio will record always from iPad microphone/line



You can import files from AudioCopy, Music Library, Document Picker (iCloud, Dropbox etc...) and AudioShare.

Access to the iPod library, this allows the application to read user's songs, audio books, and audio podcasts. The file can be converted in .wav (PCM 16

bit 44.1 kHz) or *.caf* formats and stored in the local app Documents Folder. If the file exist at path then progressive number will be attached to the file name.

The document picker feature lets users select documents from outside your app's sandbox. These include documents stored in iCloud Drive and documents provided by a third-party extension. Users can open these documents directly, editing them in place. This access simplifies sharing documents between apps and easily enables more complex workflows.

Add files through iTunes

- Connect your iPad to your computer and then open iTunes. Select your iPad under the DEVICES header in the left navigation column.
- Click on the "Apps" tab above the main window.
- Scroll down to the "File Sharing" section.
- Select *apeDelay* from the list of Apps.
- Under "*apeDelay* Documents" click the "Add" button; this opens a dialog box to select the location of the presets on your computer.

## Control Manager



MIDI



Accelerometer X



Accelerometer Y



LFO

After selecting **MIDI**, *apeDelay* enters into "learn mode" i.e. it "hears" incoming MIDI Control Change messages. It's then possible to send messages with MIDI hardware, Virtual MIDI and Network MIDI. Flashing screen means the association between the parameter and the MIDI message has been successful and displays the corresponding control Change and Channel. Alternatively you can enter direct CC and MIDI Channel number through number keyboard. You will also receive an additional setting: 'Widget Range' that allows you to resize the range of action on the parameter. This is because you can use all 128 steps MIDI to control precisely particular part of the parameters.

**Accelerometer X** and **Y** are used to control the parameters through the horizontal or vertical inclination of the device.

**LFO**, Low Frequency Modulation is a table look-up oscillator with seven built-in shapes. The frequency of LFO is expressed in Hz and BPM (Beats per Minute). You can get the period time by dividing 1/freq. The LFO Frequency value is converted in BPM (Beats Per Minute), you can adjust this value through the minus/plus buttons, these will replace current value with the integer BPM (previous/next) or you can TAP to set your own Tempo.

φ Will reset to zero the phase of current LFO.

Φ Will reset to zero the phase of ALL LFO actives.



Enabling the Link symbol, you will disable the 'Low Frequency Oscillator in Hz' Slider, so the value of the current LFO is sampled from the global 'MASTER BPM'. You can adjust the BPM value from SYNC view. When the MIDI Clock or Ableton Link is enabled (see MIDI Manager and SYNC) the BPM value will affect all LFO enabled for SYNC mode. The goal of the 'SYNC Subdivision' Slider is to rescale the 'MASTER BPM' from SYNC according to the relative symbol (abbreviate musical note time values):

Normal : 1/1, 1/2, 1/4, 1/8, 1/16, 1/32, 1/64

Triplets : 1/1T, 1/2T, 1/4T, 1/8T, 1/16T, 1/32T, 1/64T

Dotted : 1/1D, 1/2D, 1/4D, 1/8D, 1/16D, 1/32D, 1/64D

Where 'D' is a **dotted** note and 'T' is **triplet**.

With 1/4 (Default), the BPM follows the 'SYNC BPM' or 'MIDI Clock' BPM when enabled, i.e. 120 BPM corresponds to 1 Hz.

- 1/4 - each step is a quarter note (or BPM), e.g. 60 BPM is 0.5 Hz
- 1/4D - each step is a dotted quarter note (or 1.5 x BPM),
- 1/4T - each step is a triplet quarter note (or 0.5 / 3) etc.

♪ Reset default value (1/4 = 120 BPM)

## MIDI

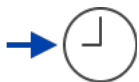
You can enable/disable the incoming MIDI signal from all the physical, virtual and network ports available. As for the MIDI ports, you can enable/disable the MIDI Clock on a port and the configuration is saved as default and restored when you open the app.



If the Core MIDI Network is connected a wifi symbol will appear in the Network port cell.



Only ports that receiving MIDI Clock will be displayed as icons, touch the clock symbol (if present) to enable/disable receiving MIDI Clock. It will change its color from red to blue. You can receive MIDI Clock from one port at a time, you can enable/disable the clock for the current port or mutually selects another one in the list.



You can receive MIDI Clock from one port at a time, you can enable/disable the Clock for the current port or mutually selects another one in the list.

**Channel** sets the input channel for the selected port, the *apeFilter* DK (Keyboard) will receive the Note On/Off messages in OMNI (from all 16 channels) or, one of the 16 channels.

### Configure Bluetooth LE MIDI

With the release of iOS 8 and OS X Yosemite, sending and receiving MIDI data is supported using Bluetooth Low Energy connections on any iOS device or Mac that has native Bluetooth Low Energy support. All established connections are secure which means that pairing is enforced and connections cannot be made to your devices without your explicit consent. After a connection is established, it simply appears as an ordinary MIDI device that any MIDI application can communicate with.

### Enable NRPN

NRPN stands for "Non-Registered Parameter Number" and is part of the MIDI specification for the control of electronic musical instruments. NRPNs allow for manufacturer-specific or instrument-specific MIDI controllers that are not part of the basic MIDI standard.

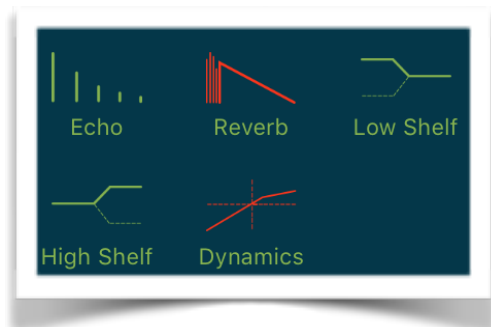
Unlike other MIDI controllers (such as velocity, modulation, volume, etc.), NRPNs require more than one piece of controller data to be sent. First, controller 99 - NRPN Most Significant Byte (MSB) - followed by 98 - NRPN Least Significant Byte (LSB) sent as a pair specify the parameter to be changed. Controller 6 then sets the value of the parameter in question. Controller 38 may optionally then be sent as a fine adjustment to the value set by controller 6.

This fine adjustment is part of the conventional MIDI controller specification, where any of the first 32 controls can be optionally paired with a control offset 32 higher. This is the rare 14-bit Continuous Controller feature of the MIDI specification, and NRPNs simply take advantage of that existing option in the same way offering 16,384 possible values instead of only 128.

(<http://en.wikipedia.org/wiki/NRPN>)

When you enable NRPN, you should not employ CC 99 and 98 as the normal CC in order to avoid an undesired overlap. An NRPN message must be sent with this order: CC 99 98 6 38 where the first couple is the CC number and the second couple is the data. You can MIDI learn as for the normal CC, and NRPN works for all knobs and parameters. Although an NRPN CC number can be greater than 127, you will not be able to learn CC beyond 127.

## Post Processing Effects



After the *apeDelay* Spectral manipulations, you can change the output sound using the time domain FX chains.

The first effect of the chain is '**Stereo Echo**' which receives signal from the *apeDelay*. When it is enabled, the processed signal is delivered to the next effect in the chain and bypassed when it is disabled.

The amazing ClassicVerb is a classic reverberation based on an high-quality algorithm is also provided. It is possible to control, independently, the early-reflections and the reverberation tail.

Special thanks to **Carmine Cella**.

[www.sonic-pad.com](http://www.sonic-pad.com)

## Dynamics Processor

After the *apeDelay*, you can change the output sound using a conventional compressor and expander effect.

This is used to either reduce or expand the dynamic range of an audio signal. The Dynamics Processor controls set high (compression) and low (expansion) threshold volume levels. When the incoming audio is between these levels, it is left unchanged. Audio that rises above the upper threshold is cut in volume to bring it back down to that level (compression). Audio that falls below the lower threshold is cut in volume to make quiet sounds even quieter (downward expansion).

Additional controls adjust the attack and release time for the plugin's volume envelopes, the expansion ratio, the compression headroom, and a master gain to boost or cut volume on the Dynamics Processor's output.

Threshold: when the signal is above the threshold it is compressed

Headroom: upper limit for the compressor, a limiter prevents the signal to go above this threshold

Attack and Release: activation and de-activation times for the compression when it is above the threshold

Exp Threshold: when the signal is below the Exp Threshold it is backward expanded

Exp Ratio: expansion ratio

## Settings

**Buffer Size** set the Audio Device latency. When you run *apeDelay* from Audiobus, or Inter-App this value will be taken from Audiobus or Inter-App Host. Warning! When an app runs first and keeps running in the background, the Sampling Rate and Buffer Size will impose for the whole iOS while running.

### FFT Size

This is the Fast Fourier Transform Size expressed in samples.

It must be a power of 2 such as 512, 1024 or 2048 (to give a few commonly used values).

For example, if your FFT size is 2048 samples long, the FFT analysis gives you 1024 equally-spaced frequency bins from 0 Hz to Nyquist.

### FFT Overlaps

The basic algorithm is known as a Short Term Fourier Transform (STFT) which is a set of overlapping "windows" of input and output data. This kind of

setup is necessary to reduce unwanted modulation on input to the FFT and allows us to modify the FFT data without unwanted overlap-add artefacts on output. You can experiment with NO overlap in order to hear the windowing modulation between FFT frames. A good value for `apeDelay` is 2 (default).

**Snapshot Pad Resolution Update** sets the time interval for the interpolations, from about 15 to 350 milliseconds. Short times for higher resolution but higher consumption of CPU.

**Save/Restore the Last App Setup**, when you exit from the application, save the status and reload upon next opening of the app.

### **Others Settings**

The switch in this section are self-explanatory. The first hide all warning messages and User Interface flashing when you store or load a preset etc...

The others are designed for include or exclude Control Manager Assignations and Knob Color when you store a new Snapshot.