

# Ambi Pan & Ambi Head **Manual**

v1.2

v1.2



# Ambi Pan/Head Manual

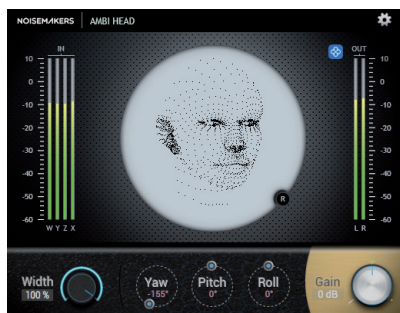
Ambi Pan/Head is a professional plugin suite for creating 3D audio scenes in a minute, ready to embed in 360 videos and immersive experiences.

- **AMBI PAN** is the panner, to position input sounds in the 3D scene.
- **AMBI HEAD** is the renderer, converting the 3D scene into binaural audio.

This document describes how to use the plugins, the underlying Ambisonic framework, and the Virtual Reality (VR) audio workflow.



Ambi Pan V1.2



Ambi Head V1.2

## Background

Ambisonics is a “scene-based” paradigm to capture, transform and render 3D audio. It is ideal for 360 videos and interactive media allowing listeners to rotate their head into the scene.

In practice, first-order Ambisonics is a 3D extension of mid/side stereo with additional height and depth channels. It uses 4 audio channels, called W (omni-directional), X, Y and Z (bi-directional components along the X, Y and Z axis). The resulting 4-channel signal is called B-format. It contains the 3D sound scene.

B-format signals can be recorded with a microphone, like the Sennheiser AMBEO VR Mic, or created with Ambi Pan from traditional sounds (mono, stereo...). Combination of both approaches is ideal to create convincing 3D scenes.

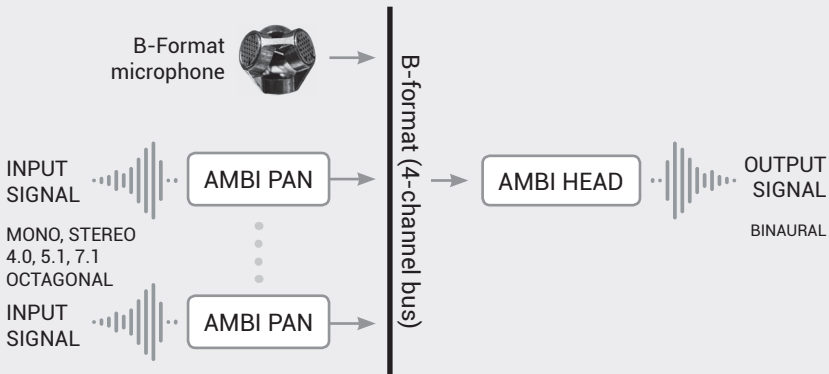


Fig1 - Ambisonic workflow: microphone, panners (Ambi Pan) and renderer (Ambi Head)

The typical routing scheme is illustrated in Fig1. All sounds are mixed in a 4-channel B-format bus, which is converted by Ambi Head into 3D binaural audio.

### ***B-format : ambiX or FuMa ?***

*There are two B-format conventions, called ambiX (used by Youtube 360) and FuMa. Both are equivalent, the only difference is the order and normalization of the WXYZ channels. Noise Makers plugins are compatible with both formats, and use ambiX as default.*

### ***Can I use Ambi Pan / Head with a VR ambisonic microphone ?***

*Yes. Ambi Head will convert your B-format recordings to binaural. Ambi Pan will let you add mono or stereo sources to the mix, e.g., spot microphones. More details can be found in the [AMBE0 Blueprints](#) edited by Sennheiser.*

*First, make sure to convert your recordings from A to B-format. This can be done with plugins usually provided by the microphone manufacturer. The output of these plugins may be FuMa or ambiX. If needed you can use our free [Ambi Converter](#) to convert FuMa to ambiX and vice-versa.*

### ***Where can I find free B-format sounds ?***

*A nice collection of sound examples is provided at [www.ambisonia.com](http://www.ambisonia.com)*

## Installation

Noise Makers plugins are compatible with a variety of digital audio workstations (DAW) and available in three formats:

- VST : for Reaper, Nuendo, etc.
- AU : for Logic Pro X
- AAX : for Protools HD (note that HD is required as Ambi plugins use 4-channel tracks)

Download the plugin in your favorite format at  
[www.noisemakers.fr/downloads](http://www.noisemakers.fr/downloads)

On Mac, open the dmg and drag and drop the plugin (.vst, .component or .aaxplugin) into the provided shortcut.

On PC, unzip the file and put the dll in your favorite plugin folder (e.g., C:\Program Files\Common Files\Avid\Audio\Plug-Ins\ for Protools or C:\Program Files\Steinberg\VSTPlugins\ for Reaper or Nuendo).

Restart your DAW, and you are done. If you use Reaper, Protools HD, Nuendo or Logic, you can download one of the template projects provided on our website. They will help you to reproduce the routing scheme described in Fig1.

Note : Evaluation versions of the plugins are full-featured, but produce intermittent silences and cannot be used for commercial purposes. After buying a license on our website, you will receive additional instructions to authorize the plugins with a serial number.

***What buffer sizes are supported ?***

*All buffer sizes up to 8192 samples.*

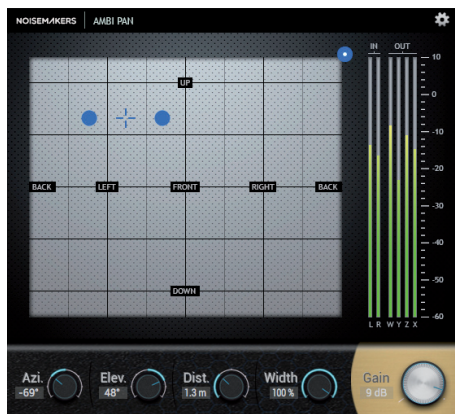
***What sampling frequencies are supported ?***

*44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz and 192 kHz.*

***Do the plugins introduce any latency ?***

*Ambi Pan has no latency (0 samples). Ambi Head has a latency of 512 samples, which is equivalent to 10.6 milliseconds at 48 kHz, and 5.3 milliseconds at 96 kHz. For comparison, a 25-frame/sec video has 40 ms between each frame.*

# AMBI PAN



## Main features

- 3D panning (azimuth, elevation, distance)
- Spatial width control
- Distance attenuation
- Azimuth/distance pad
- Azimuth/elevation pad
- Ambi Scene : transparent panning window

Ambi Pan applies 3D positioning (azimuth, elevation, distance) and spatial width to the input sound. Two different panning pads are available to provide simple yet efficient 3D visualization. The plugin accepts mono, stereo and surround inputs. The output is B-format (ambiX by default).

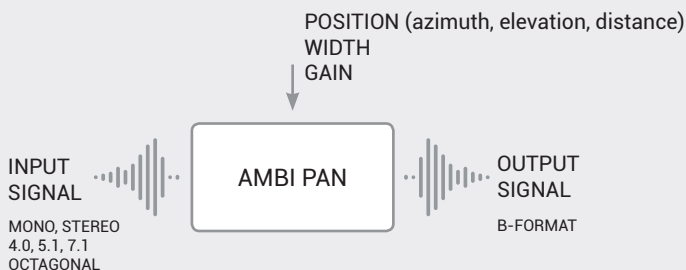
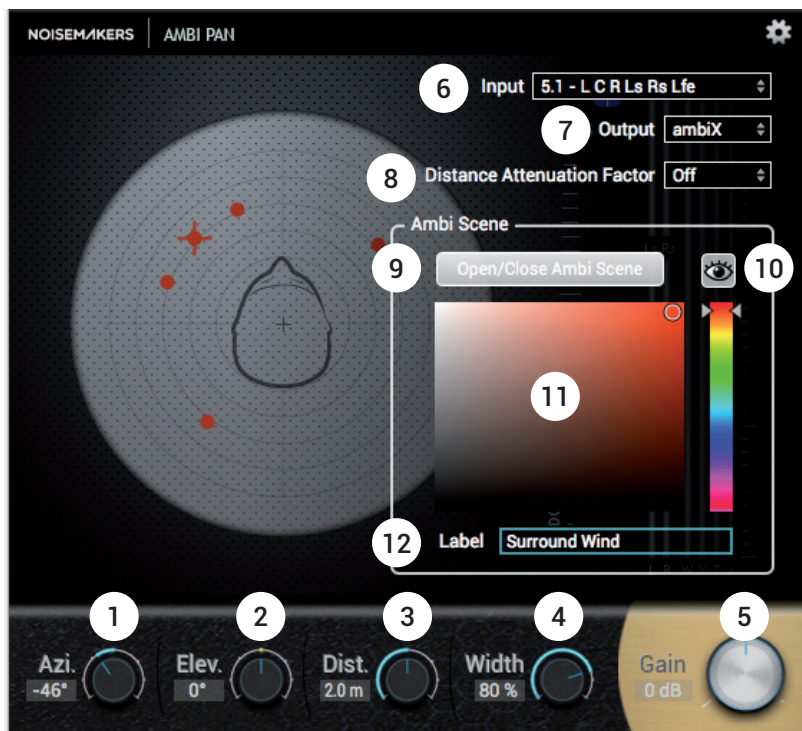


Fig2 - Ambi Pan functional diagram





1. Azimuth, between -180 and +180 degrees
2. Elevation, between -90 and +90 degrees
3. Distance, between 0 and 4 meters (weighted by the distance factor, see 8)
4. Width, spatial spreading between 0 and 100%
5. Output gain, between -90 and +10dB
6. Input type (mono, stereo, 4.0, 5.1, 7.1, octagonal) and choice of input channel order
7. Output type (ambiX or FuMa)
8. Distance attenuation factor, applies a gain attenuation proportional to the distance, from 1: weak attenuation, to 5: strong attenuation
9. Button to open/close Ambi Scene
10. Button to show/hide the source on Ambi Scene
11. Color of the source on Ambi Scene
12. Label of the source on Ambi Scene

≡ Tip : Double click a knob to reset it to the default value.

The transparent window Ambi Scene allows manipulating all sources on top of a 360 equirectangular video. This is really helpful when working on a mix with many sound sources all over the place.

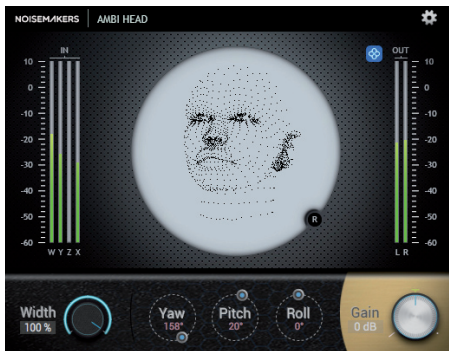
≡ Tip : Ambi Pan has a parameter `showOnAmbiScene`, available in the automation of your DAW. This allows you to show/hide each source only at specific times.

≡ Tip : Each source has its own custom label. Double click in Ambi Scene to show/hide the labels.



Fig3 - Ambi Scene: manipulate sound sources on top of a 360 video. Picture courtesy of [www.studio-geppetto.com](http://www.studio-geppetto.com)

# AMBI HEAD



## Main features

- Binaural rendering of B-format signals
- 3D head rotations
- Spatial width control
- Choice of HRTFs (NoiseMakers, Youtube 360 or custom SOFA)
- Compatibility with Google Jump Inspector for Phone/Head tracking

Ambi Head uses Head Related Transfer Function (HRTF) to convert B-format signals to 3D binaural audio. It allows manipulations of the scene (rotations and control of spatial width). Youtube HRTF are optionally provided, to monitor mixes before Youtube 360 export.

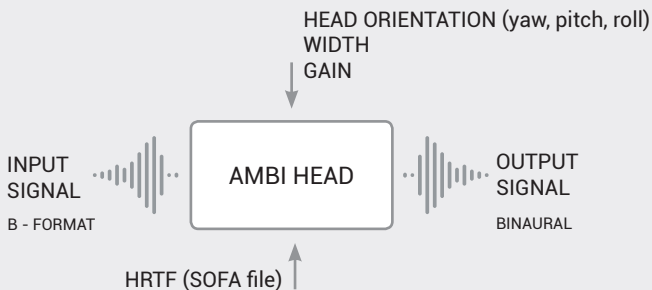


Fig4 - Ambi Head functional diagram

Ambi Head also offers a SOFA importer to load custom HRTF in [the SOFA format](#). This lets you choose “the head you want” for binaural rendering. Drag and drop them into Ambi Head to replace the default filters.

### ***Where can I find SOFA files?***

The [SOFA convention website](#) provides several HRTF measured on human heads or mannequins. For example, a SOFA measurement of the Neumann KU 100 is provided [here](#) (credits Fachhochschule Köln). Other SOFA files may be found on research laboratories and universities websites. More should come in the future; the SOFA format is still a recent standard.

### ***Can I import long reverberant HRTF?***

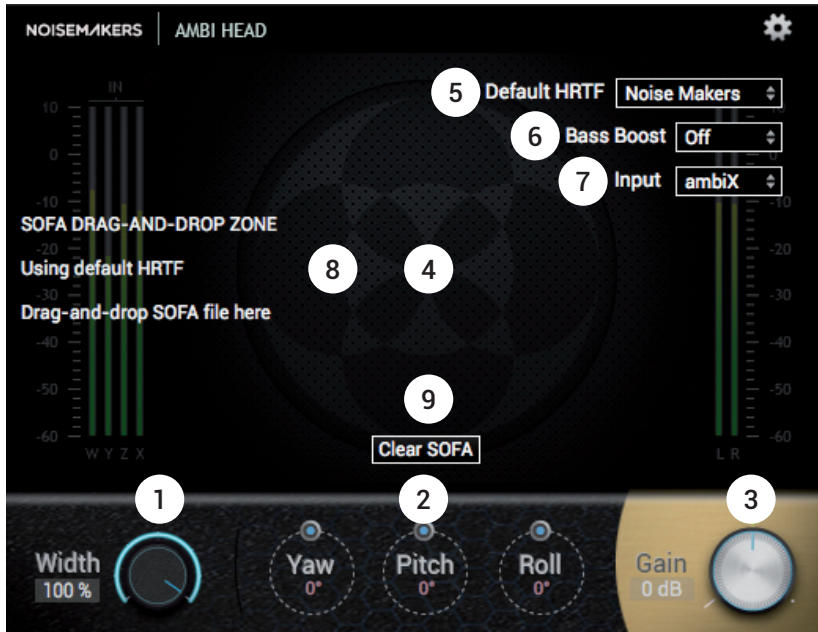
Yes, Ambi Head supports filter sizes up to 51200 samples.

### ***Can Ambi Head load all types of SOFA files?***

SOFA is a broad format, Ambi Head only supports a subset at the moment. The SOFA importer will tell you if it can load the filters or not.

### ***Is any processing applied to the SOFA files?***

Ambi Head applies no processing to the imported filters, except a gain normalization if their maximum peak exceeds one. Ambi Head does not resample the filters, so for best results you should load HRTF measured at the same sampling frequency as your session.



1. Width of the 3D scene, between 0 and 100%
2. Yaw Pitch Roll : head orientation
3. Output gain, between -90 and 10 dB
4. Goniometer (Lissajous display of the binaural output)
5. Choice of default HRTF (Noise Makers or Youtube)
6. Bass boost, between 0 and +9 dB
7. Input type (ambiX or FuMa)
8. Zone to drag and drop SOFA filters instead of the default HRTF
9. Button to reset to default HRTF

## WORKFLOW

### Routing

The recommended plugin routing is illustrated on Fig1. In practice, it may vary depending on the possibilities offered by your DAW.

A typical session contains several 4-channel tracks, with B-format signals coming from Ambi Pan or from a B-format microphone. All tracks are mixed to a single B-format bus, which contains the entire 3D scene. The B-format bus is then converted by a single instance of Ambi Head, to render binaural output for headphones.

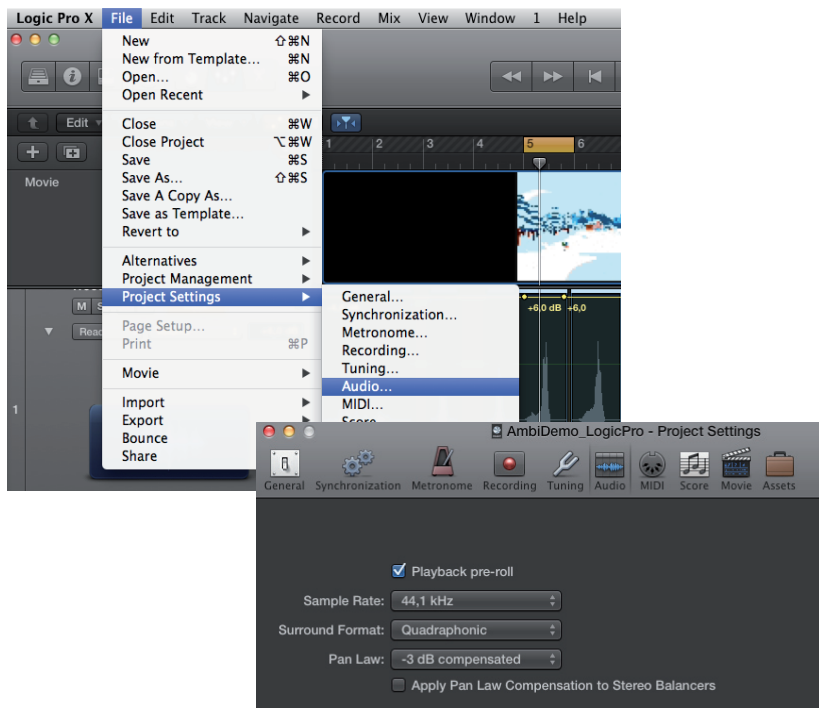
Ambi Pan always has 4 outputs (B-format) but it can have between one and eight input channels, depending on the chosen input type (mono, stereo, 4.0, 5.1, 7.1 or octagonal). Ambi Head always has 4 inputs (B-format) and two non-zero outputs (binaural).

Some DAW (e.g., Reaper, Protools HD) accept plugins with different number of channels for input and output. Others (e.g., Nuendo and Cubase) may require a 4-channel track to handle the 4 outputs of Ambi Pan correctly. This means that your session would contain only 4-channel tracks.

For Protools HD, Reaper, Nuendo and Logic Pro X, a template project is provided at [www.noisemakers.fr/ambi-pan](http://www.noisemakers.fr/ambi-pan).

## Specific Logic options

In Logic, the project must be set to Quadraphonic. This is done in the Project Settings, accessible in the menu File/Project Settings/Audio (see image below).



Then, when creating a new track for Ambi Pan, select Stereo or Mono Input, and Surround Output. For Ambi Head, select Surround Input and Stereo Output.

## Exporting to Youtube 360

This section assumes that you work with a 360 video and one of the provided project templates. If you can't find the template for your DAW, you may be able to adapt this part to your needs. Otherwise feel free to get in touch. More templates will come in the future.

To export to Youtube, you need to

1. export audio as a 4-channel ambiX WAV file
2. glue that file to your video, add metadata and export to Youtube

### STEP 1

Since Youtube and Ambi Pan use the same ambiX format, step 1 is fairly straightforward.



# PROTOOLS HD

Print Master Quad, then select the clip and press Cmd+Shift+K to export it. Choose the interleaved format.

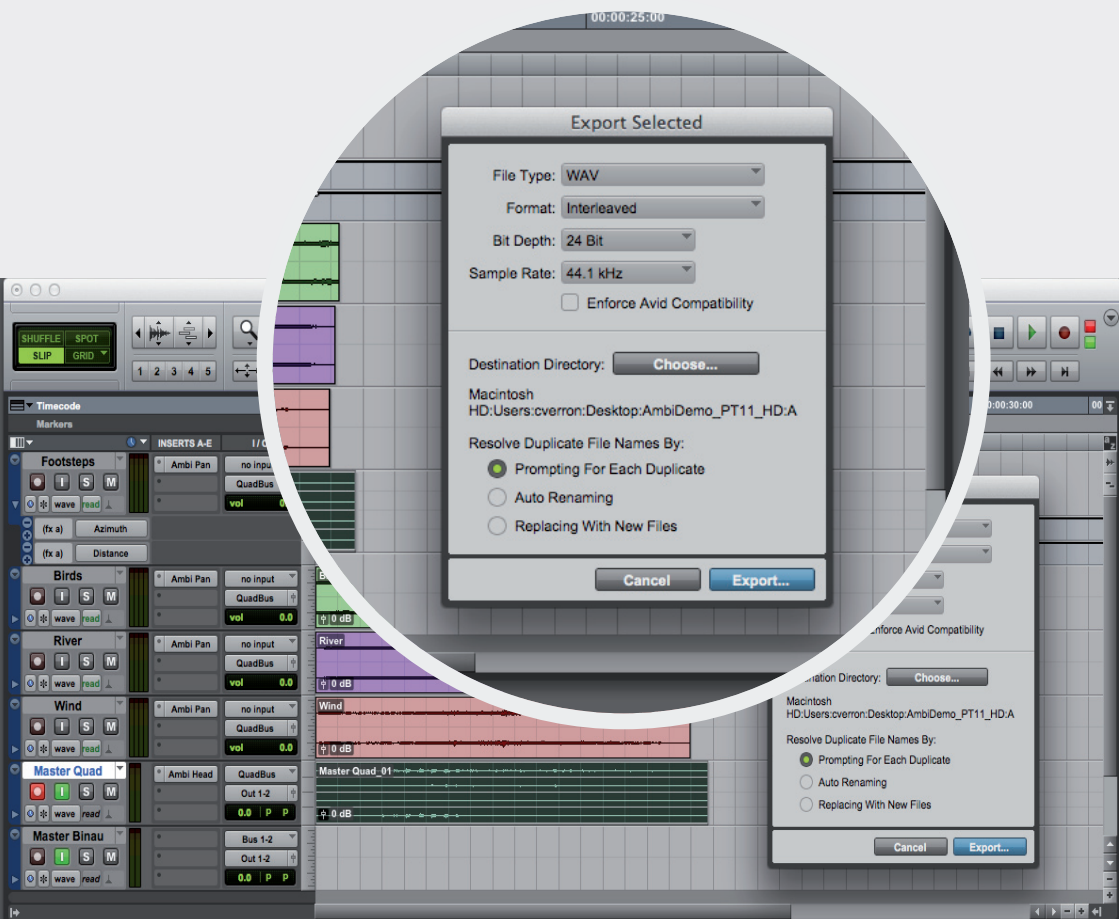


Fig5 - Protools print

## LOGIC

Turn Ambi Head off in the Master Track, then bounce it to disk. Alternatively you can create a Quadraphonic bus, route your tracks to this bus and print it.

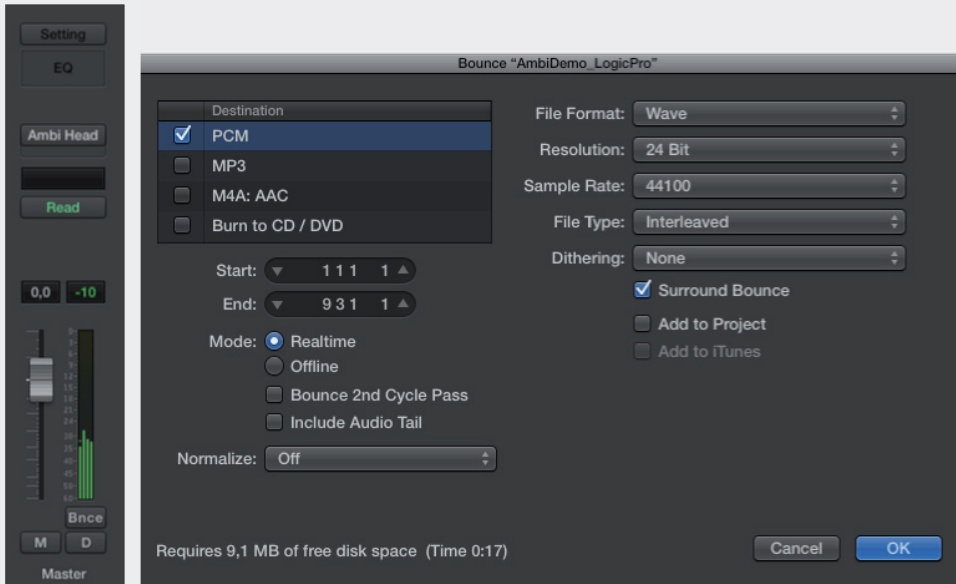


Fig6 - Logic bounce

≡ Tip : In Logic, turn off Ambi Head in the master track, then bounce

## REAPER

Turn Ambi Head off in the Master track, then render it. Reaper also gives the possibility to directly render the video including the audio mix. Both rendering settings are shown below.

Render to File

Source: Master mix Bounds: Entire project Presets

Time bounds

Start: 0:00.000 End: 0:18.304 Length: 0:18.304 ☒ Tail: 1000 ms

Output

Directory: /Users/You/Desktop Browse...

File name: AudioMix Wildcards

Render to: /Users/You/Desktop/AudioMix.wav 1 file

Options

Sample rate: 44100 Hz Channels: 4 Full-speed Offline

☒ Use project sample rate for mixing and FX/synth processing

Resample mode (if needed): Good (192pt Sinc)

☐ Tracks with only mono media to mono files

☐ Multichannel tracks to multichannel files

Master mix: ☐ Dither ☐ Noise shaping

Output format: WAV

WAV bit depth: 16 bit PCM Large files: Force RF64

☒ Write BWF (\"best\") chunk ☐ Include project filename in BWF data

Do not include markers or regions ☐ Embed project tempo (use with care)

☐ Silently increment filenames to avoid overwriting

☐ Add rendered items to new tracks in project

☐ Save copy of project to outfile.wav.RPP

Open render queue...

Add to render queue

Render 1 file...

Save changes and close

Cancel

☐ Delay queued render to allow samples to load

Fig7 - Export audio only

# REAPER

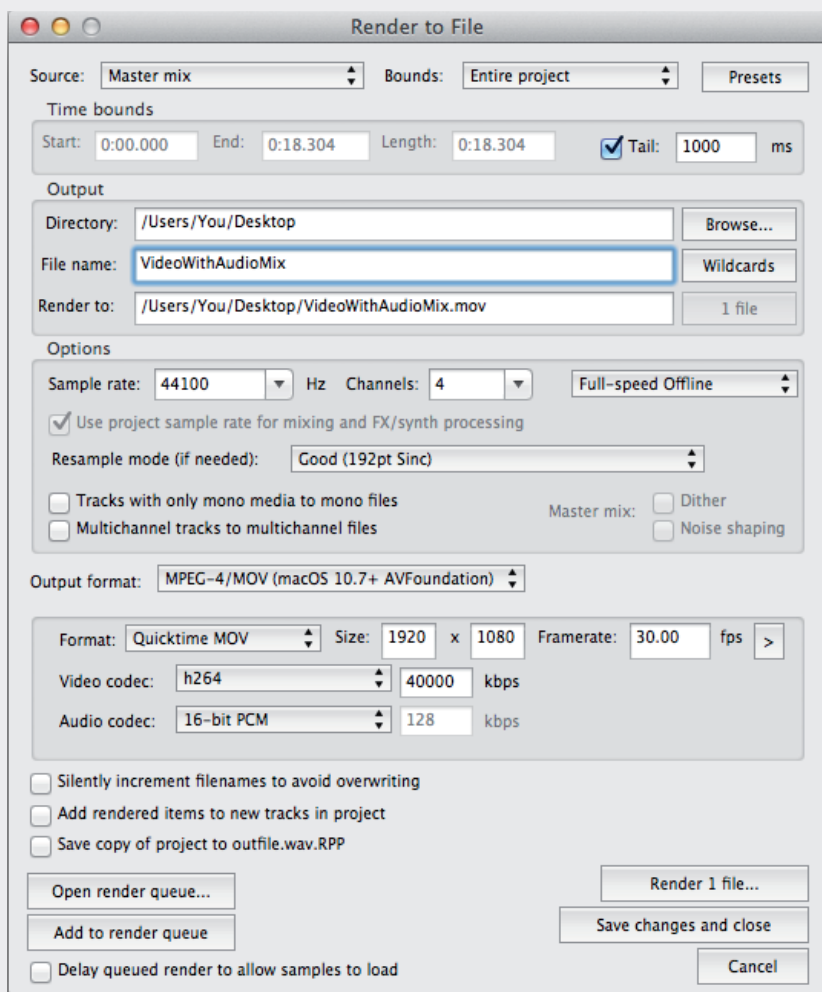


Fig8 - Export audio and video

## NUENDO

Select the Master Quad group to export the 4-channel ambiX sound file.

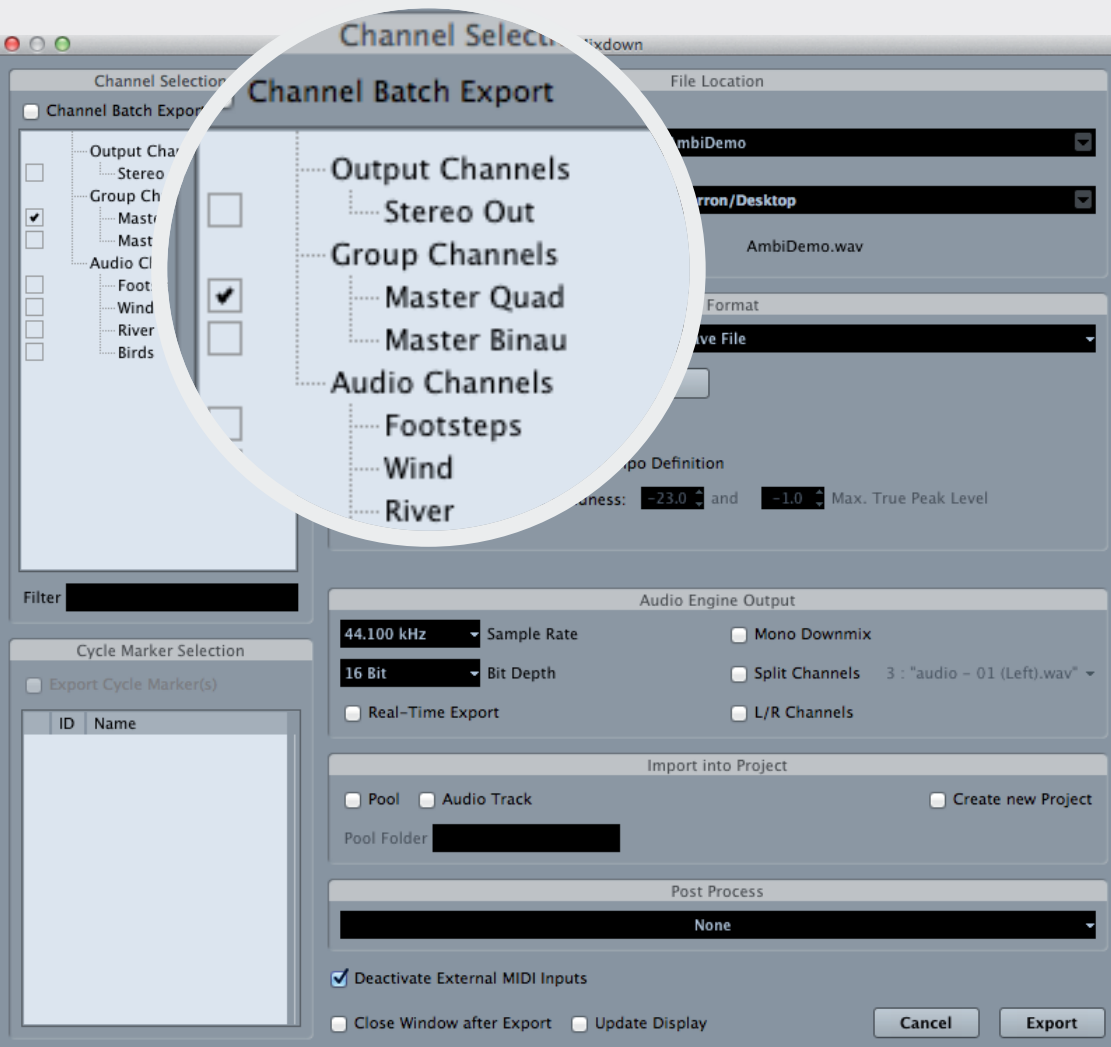


Fig9 - Nuendo export

## STEP 2

### Second step is to glue the sound file to your video.

There are several resources available online about this part, like the comprehensive [tutorial by Lidwine Hô and Hervé Dejardin](#). Basically you need to install ffmpeg, then open a terminal and enter :

```
ffmpeg -i VIDEO_IN.mov -i AUDIO_IN.wav -c:v copy -c:a pcm_s24le -af "pan=4.0|c0=c0|c1=c1|c2=c2|c3=c3" VIDEO_OUT.mov
```

Then, tag VIDEO\_OUT.mov as a 360 video file with spatial audio, following [these guidelines](#) to inject appropriate metadata.

### Finally, upload to Youtube

## Conclusion

We hope that this short introduction manual has been useful. For more questions and troubleshooting, please visit Ambi Pan/Head FAQ. And if you can't find your answer in the FAQ, feel free to drop us an email at *contact@noisemakers.fr*.

