

The 1987 Max Headroom Broadcast Incident - Mauro Lanza (2017)

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Sound engineer: Jérémie Bourgoe @ IRCAM

Tape version for Ableton Live Suite 10.1.14 (or later) & Cycling'74 Max 8.1.3 (or later)

This document describes the live-electronics required to perform the piece.

Technical description of the piece

The string quartet - 2 violins, 1 viola, 1 cello - performs surrounded by speakers. Each instrument is equipped with aerial microphones and actuators stuck to the body of the instrument. Actuators diffuse some sound effects - treatments of the live instrument signal - which are meant to resonate into the body of the instrument during playing. Microphones capture both live & actuator sounds and additional tape sounds are diffused in some close speakers, in the idea of an augmented ensemble being physically homogeneous. Instrumentalists play in sync with the tape thanks to a click-track sound monitored using one in-ear headset per instrumentalist.

Short description of the live-electronics

Live-electronics are played from an Ableton Live 10 session that uses Max For Live with Max 8. The session consists in sound-files running in sync together with the click-track, generally grouped in 4 layers (tracks) which correspond to different pre-recorded treatments of the four instruments and tape sounds to be diffused in the different speakers.

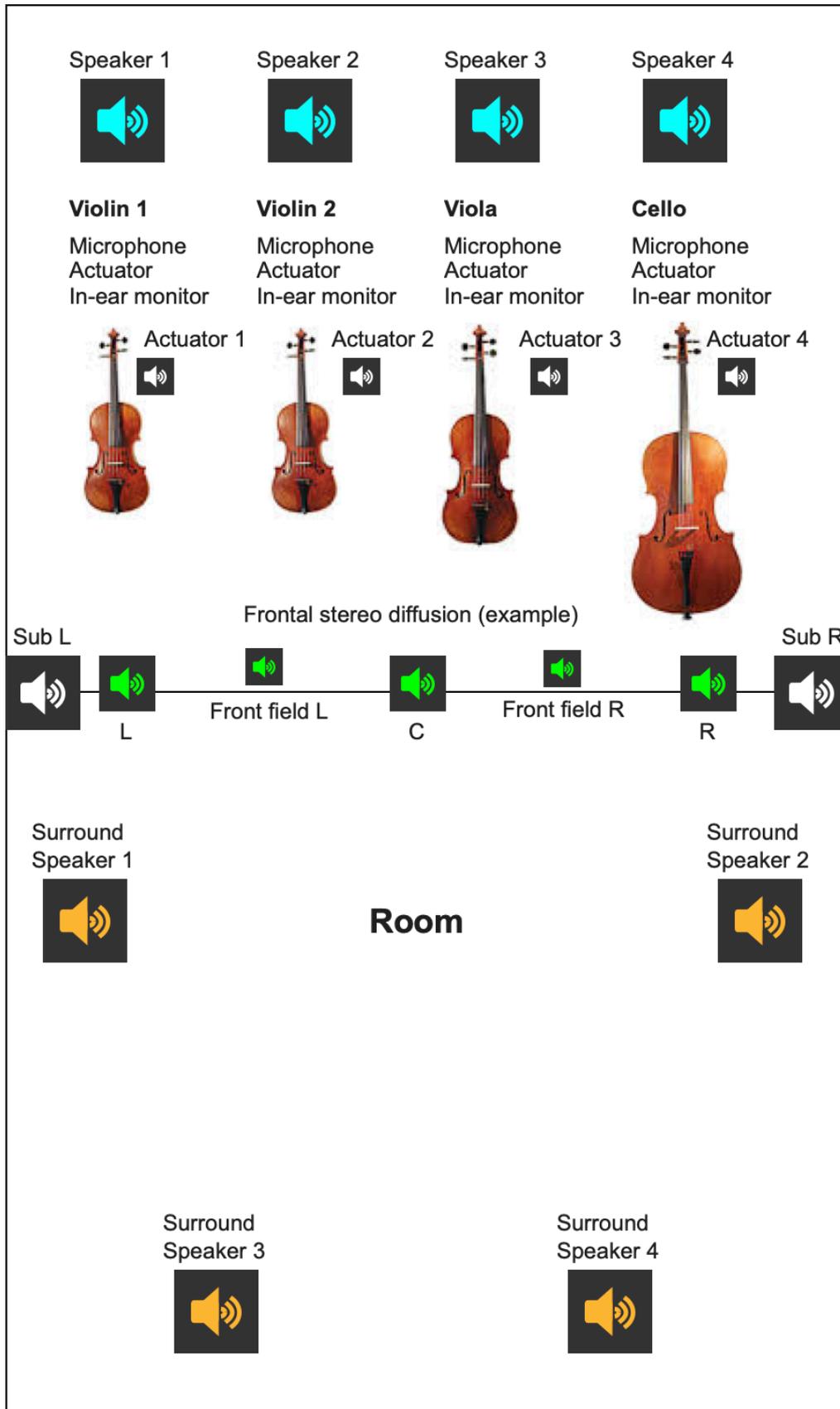
About the sound diffusion

The live-electronics sound is mainly diffused in four speakers disposed behind the performers. Pre-recorded effects are diffused directly through the four actuators. Alongside the amplified live sounds are diffused in some additional speakers disposed in a classical frontal stereo fashion. Frontal diffusion may be sustained with front field speakers. Additionally, four surround speakers disposed around the audience diffuse a reverberated sound of the global sound. The main idea is to create a wide sound while keeping a sense of localization of each instrument. Two subwoofers are required for bass reinforcement.

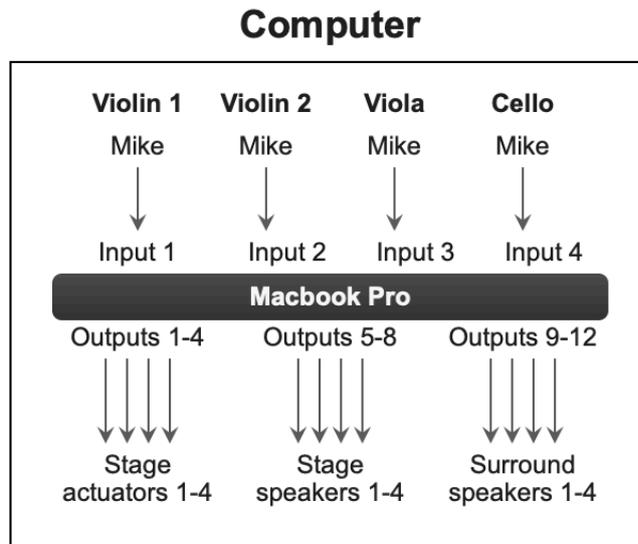


Schematic diagram of original sound setup

Stage



Schematic diagram of live-electronics routing



The sound board used with the computer must have the possibility to output 12 separate signals and host 4 separate input signals.

Important note for touring

Using actuators require numerous additional gear, dedicated amplifiers, wires, console routing, etc. It is also possible that performers refuse sticking actuators on their instruments.

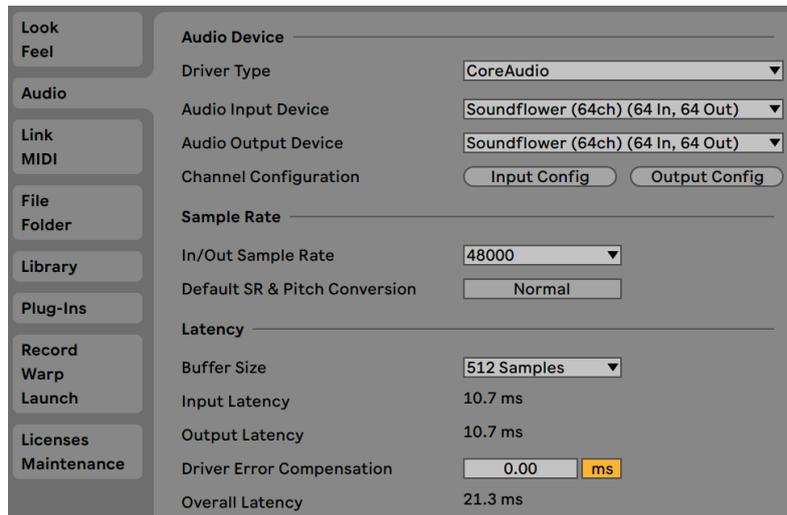
In order to facilitate touring, it is possible to not use the actuators at all. The Live session embeds 4 additional tracks that simulate the sound of the actuators through impulse response-based real time filters of violins, viola and cello. These signals may then be diffused through the four speakers on stage instead of the original actuators.

Also, if surround speakers require too much mounting time, it is possible to use the frontal speakers to diffuse the surround sound, as it only consists in multichannel reverberated sound.

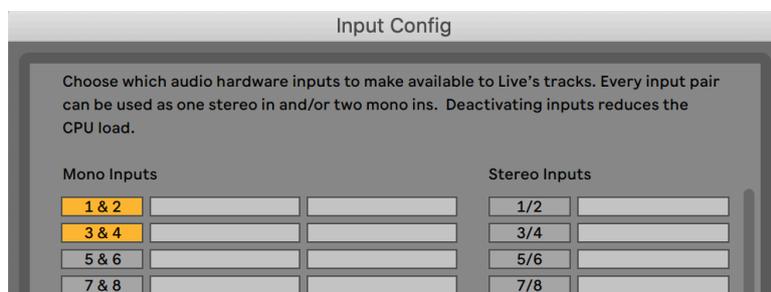
Live audio setup

Launch Live 10 and open the Preferences pane. In the audio section:

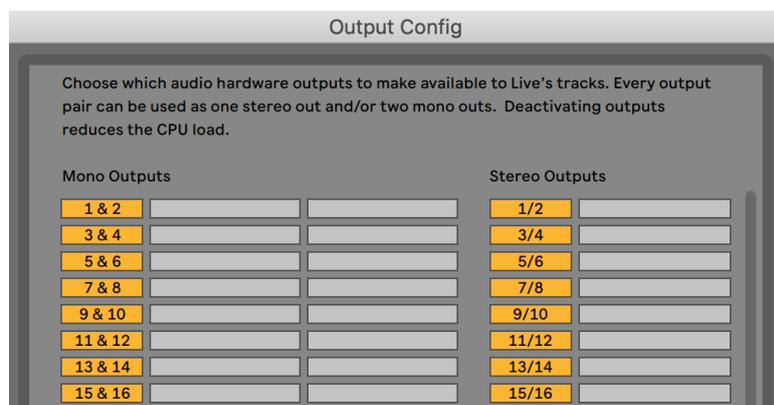
- set your sound board as Audio Input and Audio Output devices (Soundflower is used here as an example)
- set the In/Out Sample Rate to 48KHz
- set the Buffer Size to a maximum value of 512 (default)



- in the Channel Configuration pane, set the Input Config:



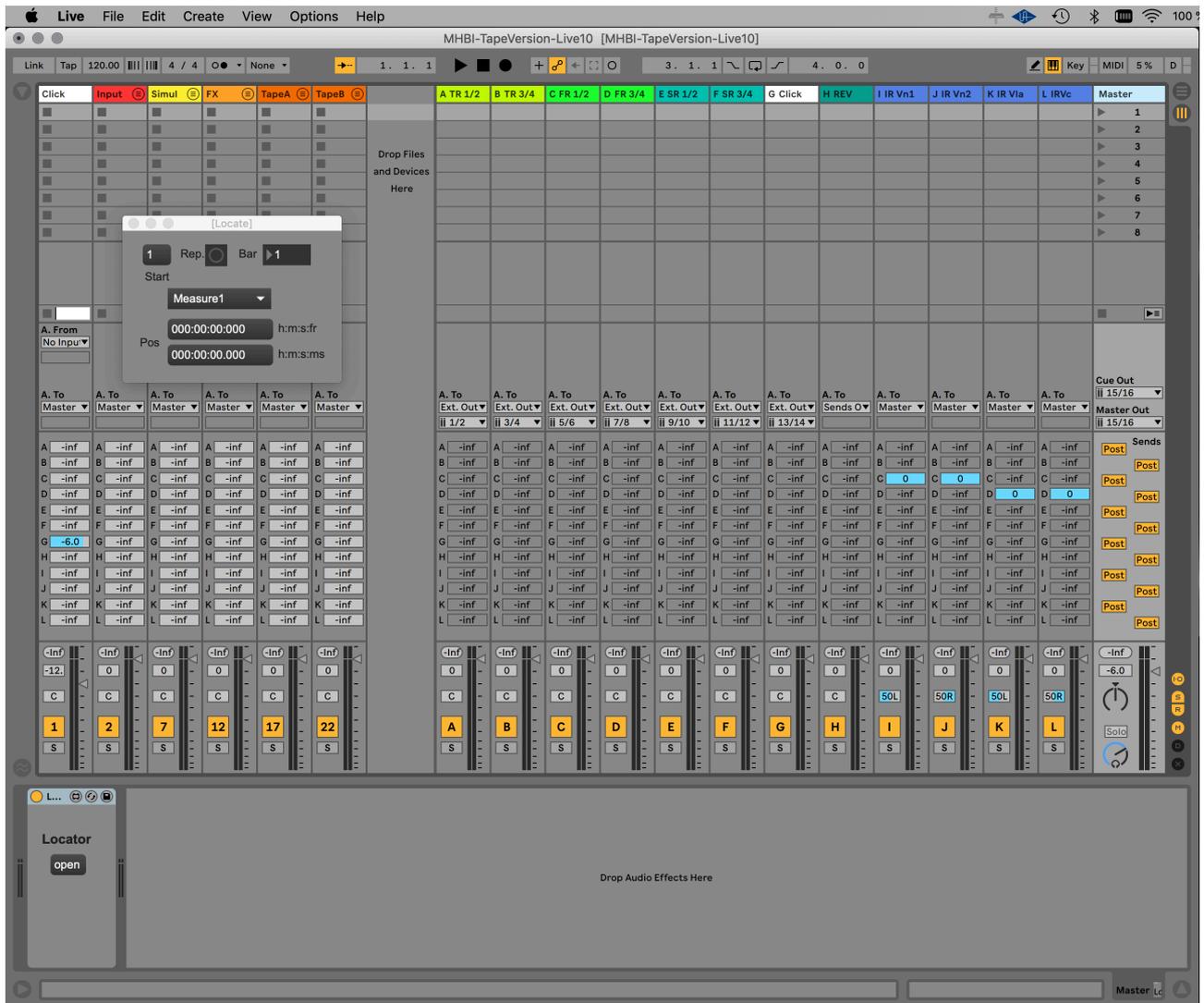
- then set the Output Config:



You may also enable all inputs and outputs. Then close the Preferences pane.

Description of the Live session

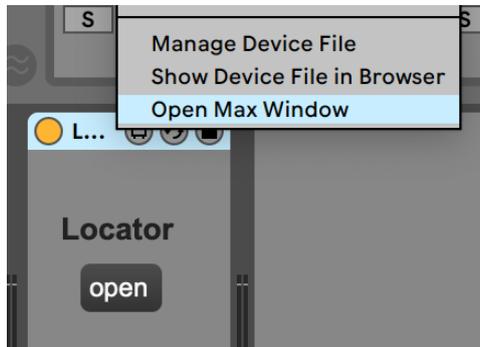
Locate and launch the MHBI-TapeVersion-Live10.aals Live document from the MHBI-TapeVersion-Live10 Project folder. The session opens in Session view:



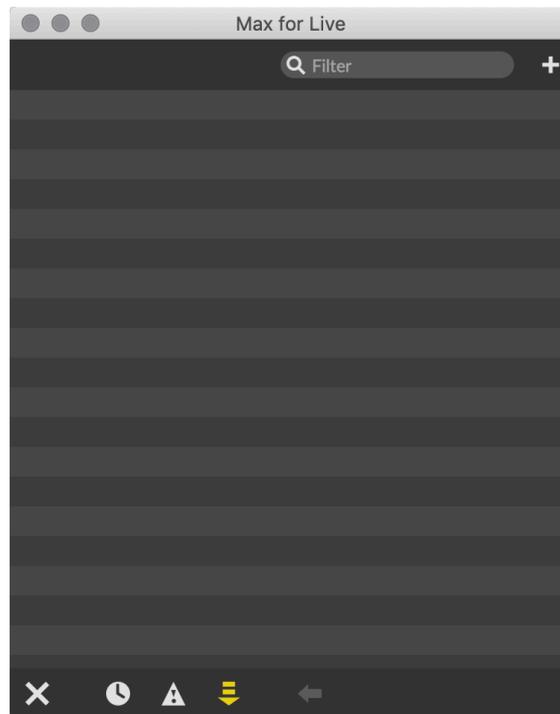
All sound sources reside in tracks on the left side, grouped by kinds. The right part of the window represents 12 Return tracks which are used as audio output masters. The small floating window allows for browsing the piece when rehearsing.

Check Max For Live content

In the Master track, locate the Locator Max For Live device, control/right-click on the top-bar of the device and select “Open Max Window”:



This opens the Max For Live console window, which shouldn't display any error message, meaning that every Max For Live content was loaded properly:

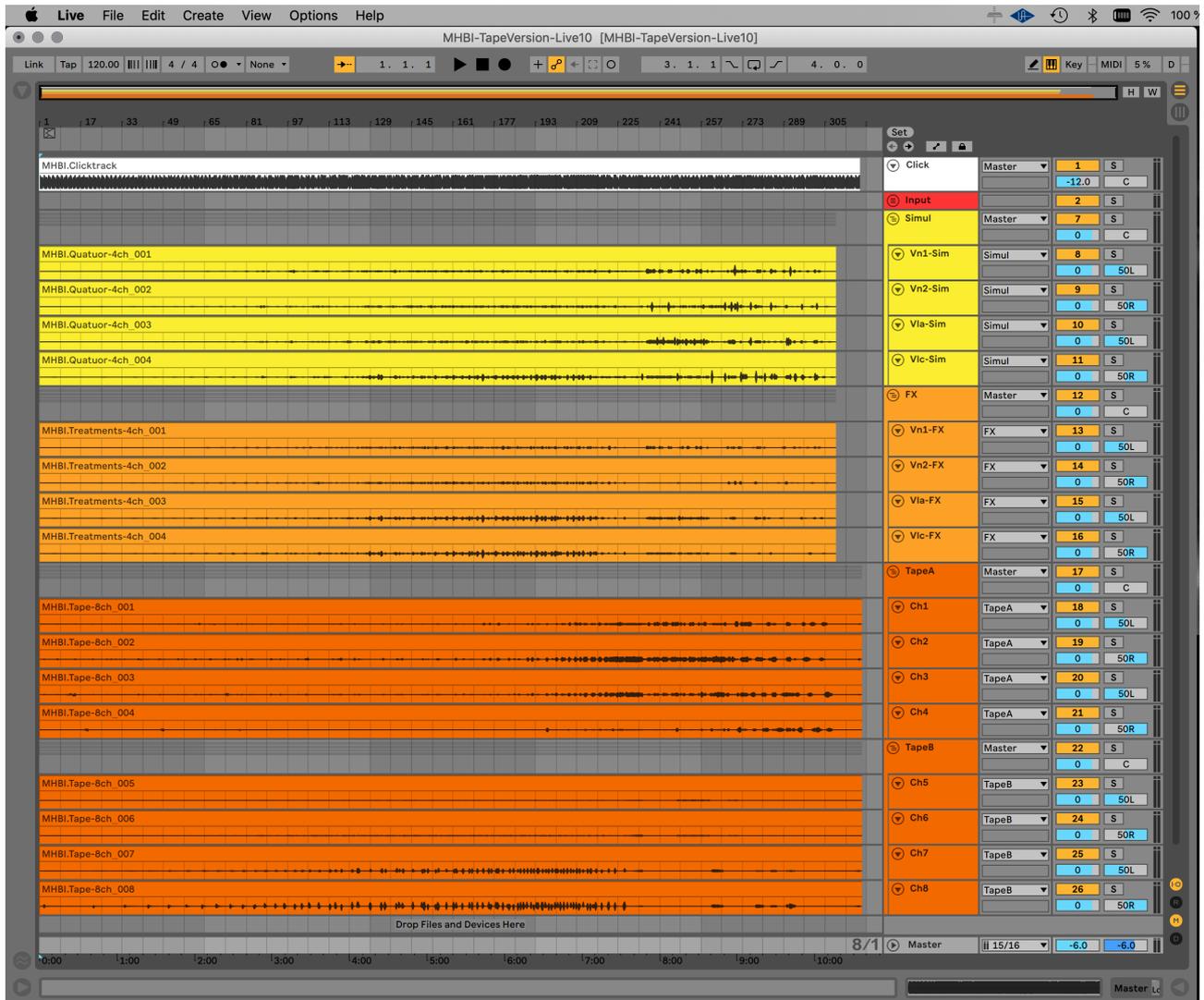


Should any error be displayed there, then you may have to check if Live uses the right version of Max 8 in the Files/Folder section of Live's preferences:



Arrangement view

Press the tab key to switch to Arrangement view:



This window displays the audio content of each track in the timeline. All tracks play in sync and start at time 00:00:00 when performing the piece.

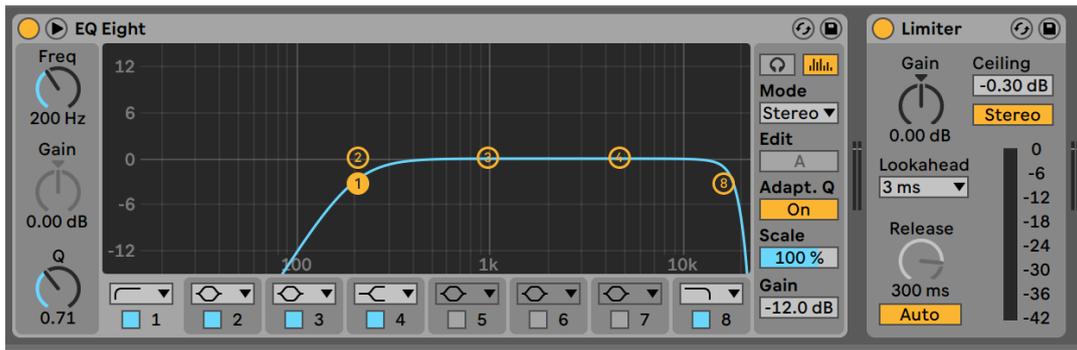
Description of the Returns section

- Returns A "TR 1/2" & B "TR 3/4": 4 outputs to the 4 actuators (or "TR"/transducers)
- Returns C "FR 1/2" & D "FR 3/4": 4 outputs to the 4 front speakers on stage
- Returns D "SR 1/2" & E "SR 3/4": 4 outputs to the 4 surround speakers
- Return G "Click": 1 output to the 4 in-ears on stage
- Return H "Rev": contains a 8 channels IRCAM reverberation Max For Live plugin
- Returns IJKL: contain each an IRCAM convolution Max For Live plugin

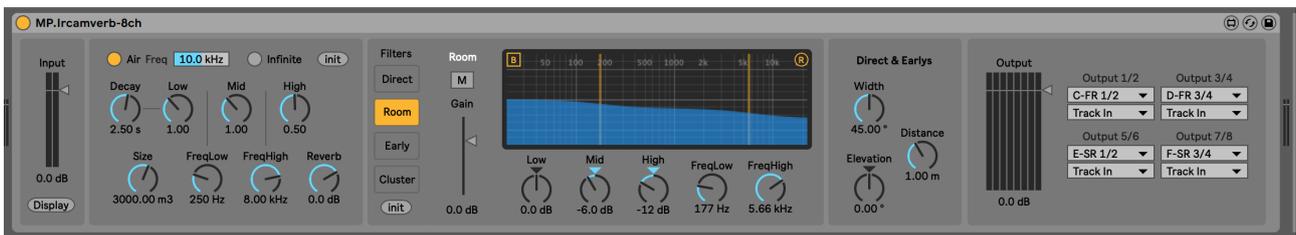
Precisions:

- all outputs-to speaker have a gain limiter:

- Returns A & B have their low frequencies cut at 200Hz, in order to not saturate the actuators (when used) with useless bass frequencies:



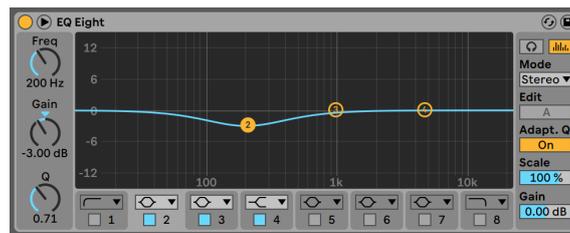
- The “REV” Return track contains a Max For Live device that embeds a 8ch reverberator:



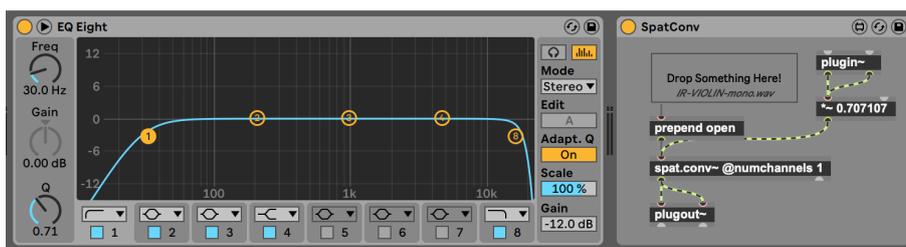
The main parameters are:

- . Decay: decay time of the reverberation
- . Size: distribution of reflexions
- . Room Filter: adjusts the color of the reverb with shelving filters
- . Output: overall gain

Direct signal (Direct pane) is muted, early reflexions (Early pane) are lowered at -10dB. The 8 channels of the reverberator are routed to the Front and Surround speakers (i.e. CDEF Returns) using internal popups. As the reverberator tends to create feedback at low-mid frequencies when pushed in volume, frequencies around 200 Hz are attenuated before entering the plugin:



The four “IR” IJKL Return tracks contain a convolution plugin that filter signals using impulse responses from the four original instruments. You may have to adjust the pre-filtering, depending on the rendering of the output sound in the speakers:



The four IR sounds are routed to the front speakers using sends C & D.

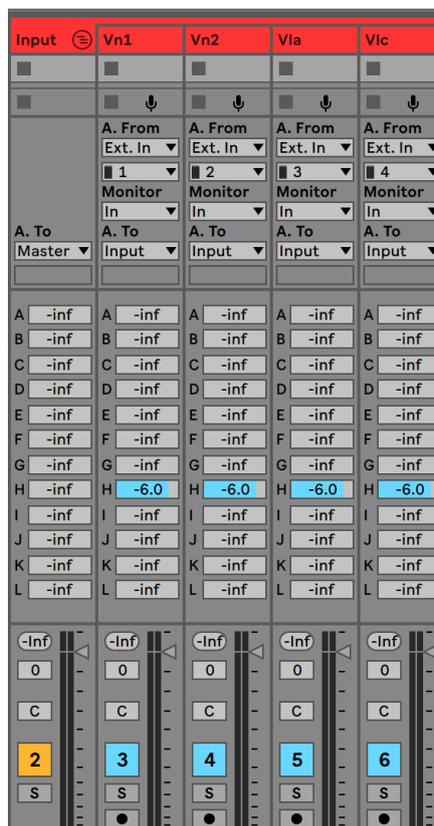
Description of the source tracks

All tracks are routed to the Return tracks using the corresponding Send's gain adjustment. By default all routings are set to -6dB, leaving the possibility to increase one or the other gain setting of +6dB.

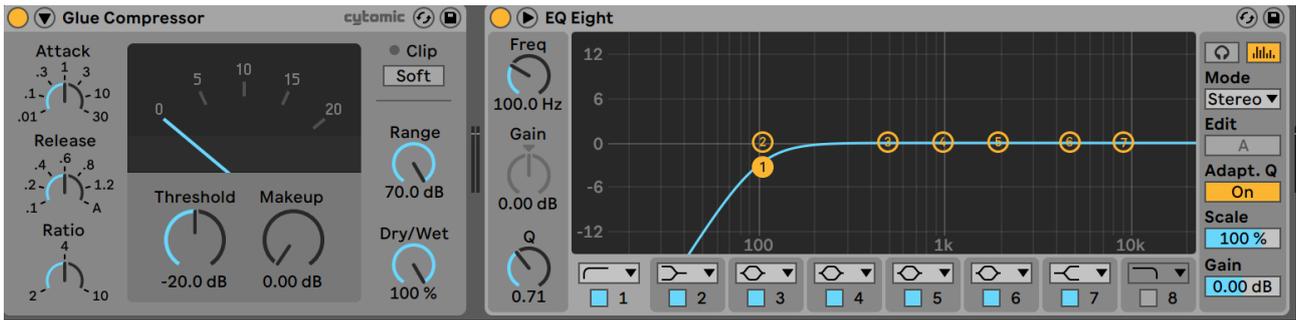
- the Click track contains the click sound to be sent to each of the four in-ear monitors on stage through Send G:



- the Input group-track hosts the live inputs from the instruments, which are routed to the reverberator (send H):



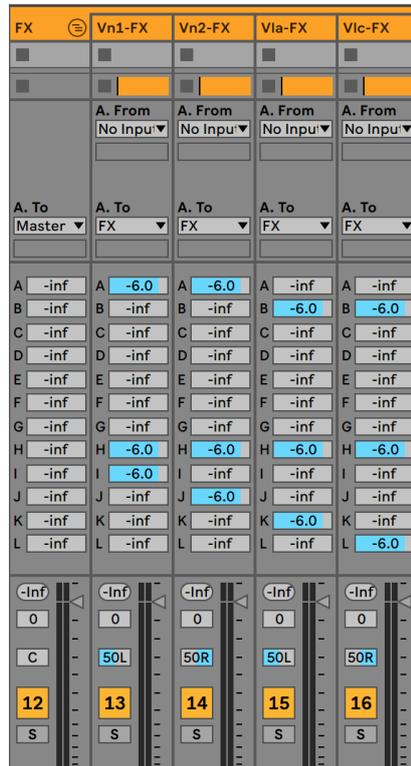
Note that each track has a bypassed EQ ready-to-use to tweak the sound of the track. In the case of the input tracks, a slight compression and low-cut filtering is also applied:



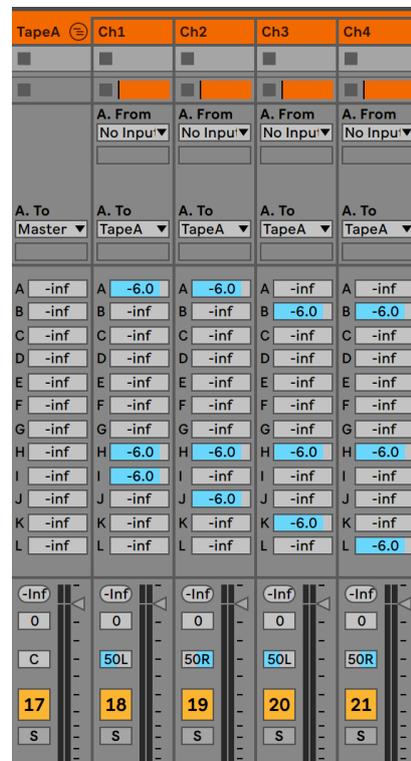
- the Simul group-track plays a simulation of the playing of the live quatuor. It is used to enhance and thicken the live sound. Tracks are routed to the Front speakers (sends C & D) and to the reverberator (send H):

| Simul | Vn1-Sim | Vn2-Sim | Vla-Sim | Vlc-Sim |
|-----------------|---------------------|---------------------|---------------------|---------------------|
| | | | | |
| | A. From No Input | A. From No Input | A. From No Input | A. From No Input |
| | | | | |
| A. To Master | A. To Simul | A. To Simul | A. To Simul | A. To Simul |
| | | | | |
| A -inf | A -inf | A -inf | A -inf | A -inf |
| B -inf | B -inf | B -inf | B -inf | B -inf |
| C -inf | C -6.0 | C -6.0 | C -inf | C -inf |
| D -inf | D -inf | D -inf | D -6.0 | D -6.0 |
| E -inf | E -inf | E -inf | E -inf | E -inf |
| F -inf | F -inf | F -inf | F -inf | F -inf |
| G -inf | G -inf | G -inf | G -inf | G -inf |
| H -inf | H -6.0 | H -6.0 | H -6.0 | H -6.0 |
| I -inf | I -inf | I -inf | I -inf | I -inf |
| J -inf | J -inf | J -inf | J -inf | J -inf |
| K -inf | K -inf | K -inf | K -inf] <td K -inf | |
| L -inf | L -inf | L -inf | L -inf | L -inf |
| -Inf | -Inf | -Inf | -Inf | -Inf |
| 0 | 0 | 0 | 0 | 0 |
| C | 50L | 50R | 50L | 50R |
| 7 | 8 | 9 | 10 | 11 |
| S | S | S | S | S |

- the FX group-track plays a recording of sound effects applied to the instrumental sounds. Tracks are routed to both actuators (when used) through sends A & B, to the reverberator (send H) and to the four IR-convolution sends (IJKL):

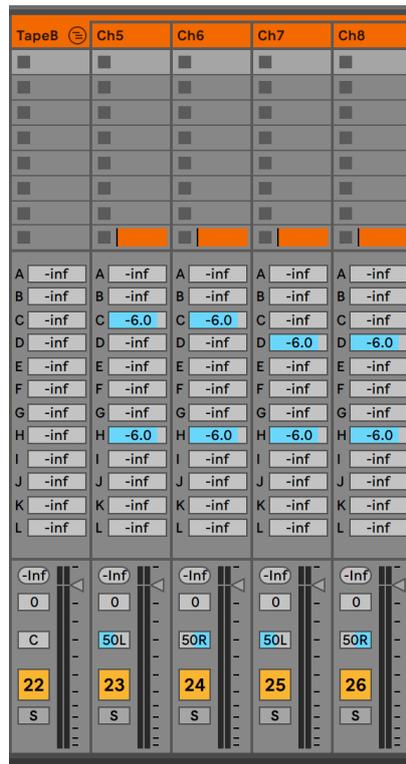


- the Tape A group-track plays some pre-recorded tape sounds. Tracks are routed to both actuators (when used) through sends A & B, to the reverberator (send H) and to the four IR-convolution sends (IJKL):

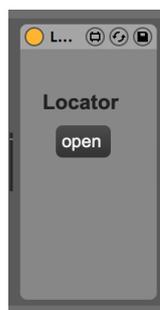


Note: you may find the FXs and Tape A to sound better without the IRs in the IJKL Return tracks : don't hesitate bypassing the IRs if it's the case.

- the Tape B group-track plays some pre-recorded tape sounds. Tracks are routed to front speakers through sends C & D, and to the reverberator (send H):

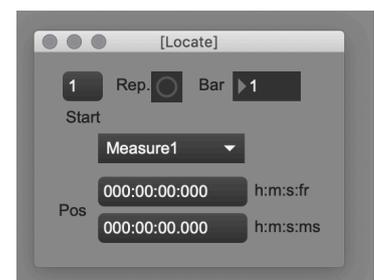


- Master track: each group-track is alongside routed to the Master track, which has its outputs set to channels 15/16. Thus the Master may be used for additional stereo monitoring.
- Locator: in the Master track, locate the Locator Max For Live device and click the Open button:



This opens a floating window from which you may place the cursor of the timeline to a given bar using a popup:

This is very useful when rehearsing: just select a bar (or Measure) and hit Play in Live's transport.



MIDI mixing

Instead of mixing the different elements of the tape from the mixing console, you may prefer using a MIDI controller such as a Beringer BCF2000 hooked to the computer through USB.

To do so, enable your controller as “Remote” device in the Link/MIDI pane of Live’s preferences:

| MIDI Ports | Track | Sync | Remote |
|---------------------------------|-------|------|--------|
| ▶ Input: IAC Driver (IAC Bus 1) | Off | Off | On |
| ▶ Input: IAC Driver (IAC Bus 2) | Off | Off | Off |
| ▶ Input: IAC Driver (IAC Bus 3) | Off | Off | Off |
| ▶ Input: IAC Driver (IAC Bus 4) | Off | Off | Off |

Then enable MIDI mapping by clicking the MIDI button in the top-right part of the Live window:



All mappable parameters turn to blue. Select the master volume fader of each group-track you wish to control and, for each, move a slider on your MIDI controller. You should see the control number appear on top of the target volume fader. The volumes of the tracks contained in each MIDI-mapped group-track will then have their volume internally scaled.

Note: you may also want to MIDI-map the master Output fader of the reverb plugin to control the overall reverberated sound:

