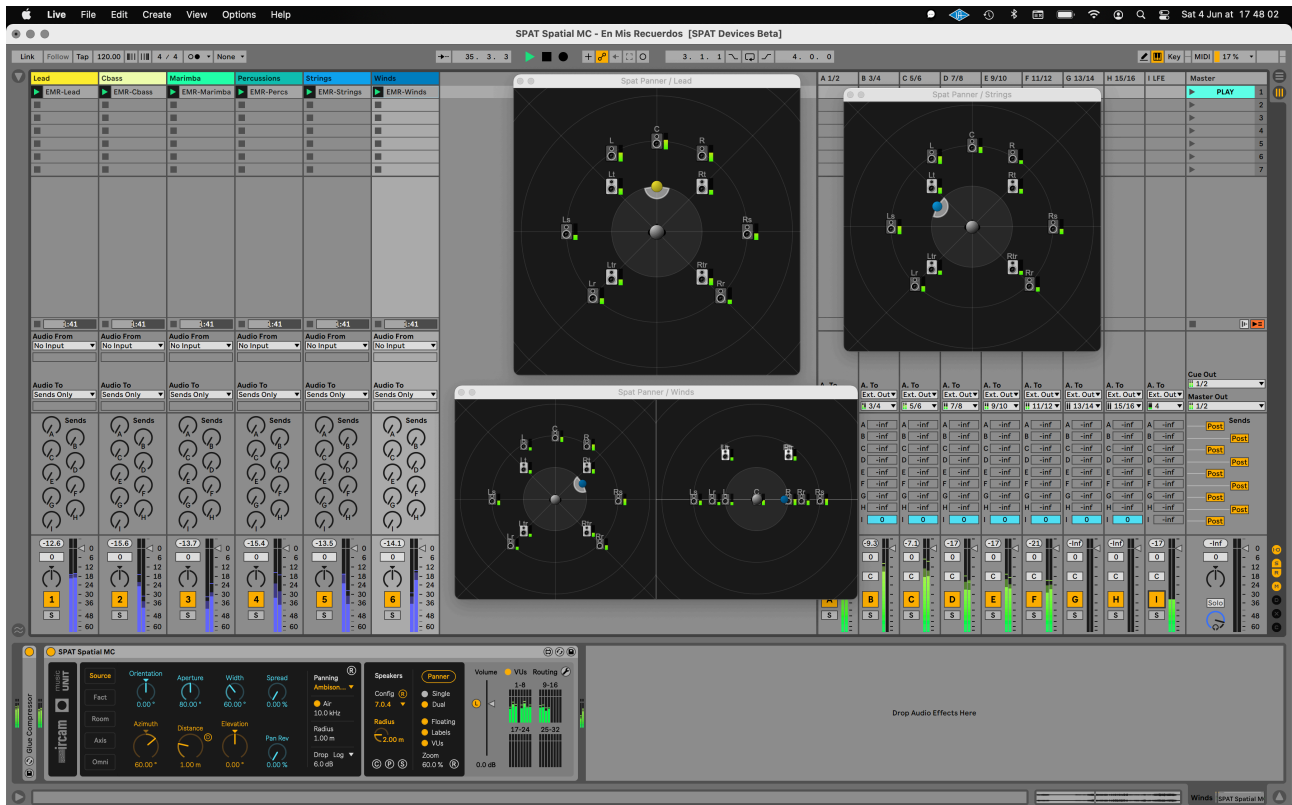


SPAT Spatial MC device

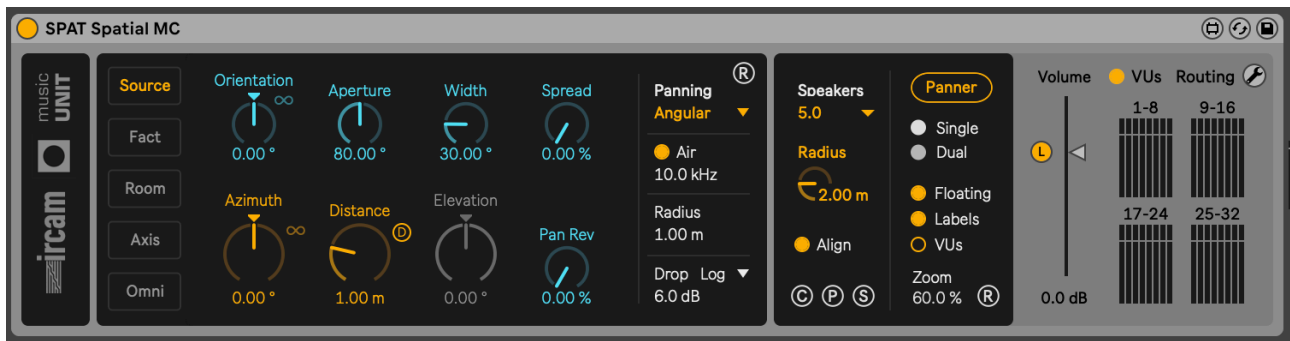
SPAT Spatial MC (MC for "multichannel") is a multichannel spatial audio processor that proposes a convincing localization of a stereo sound source in a 2D or 3D virtual or real auditory space, and includes a high quality virtual room processor.



The device can feed sound systems with up to 32 satellite speakers, and allows to select a speakers configuration among a collection of presets corresponding to most popular speakers setups, from simple quadraphonia to standard 5.1 or 7.1, up to more complex Dolby Atmos-compatible setups. The sound source's position and radiation can be graphically manipulated in a floating panner window, which interacts with navigational coordinate parameters such as azimuth, distance and elevation.

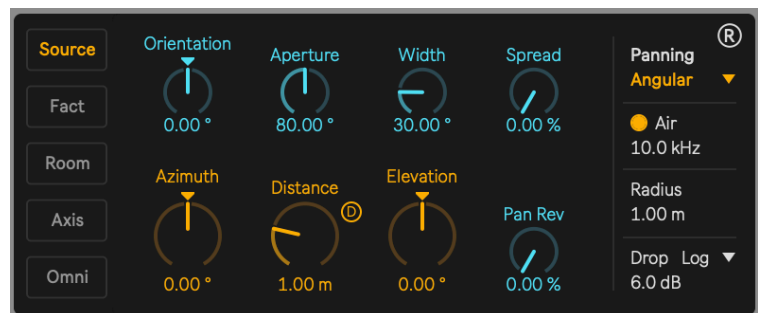
The localization of the sound source can be optimized according to the type of input sound - from solo instrument to field recording - thanks to different panning techniques such as "VBAP" (for "Vector Based Amplitude Panning"), "KNN" (for "K Nearest Neighbour") and "HOA" (for "High Order Ambisonics"). The control interface allows to specify the desired effect - like the quality of the virtual room, and how the source interacts with the room - using perceptual terms rather than technical terms. The artificial room effect can be controlled in terms of independent perceptual attributes derived from psychoacoustic research carried out at IRCAM.

Structure of the user interface

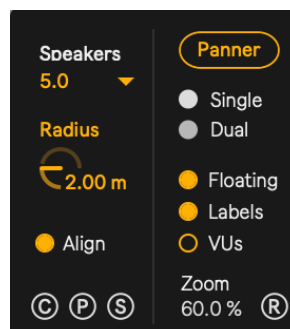


The user interface is divided in three main sections:

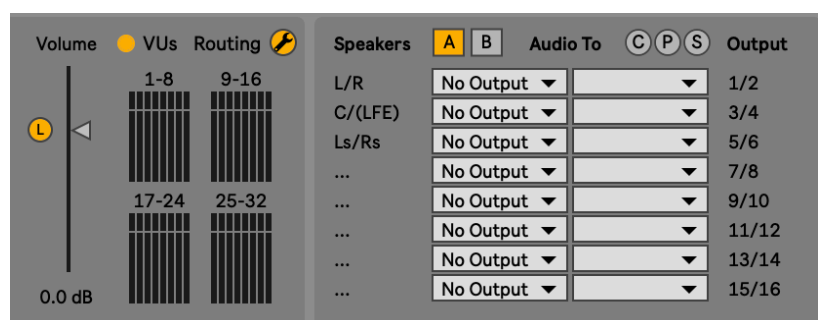
Source & Room controls:



Speakers & Panner section:



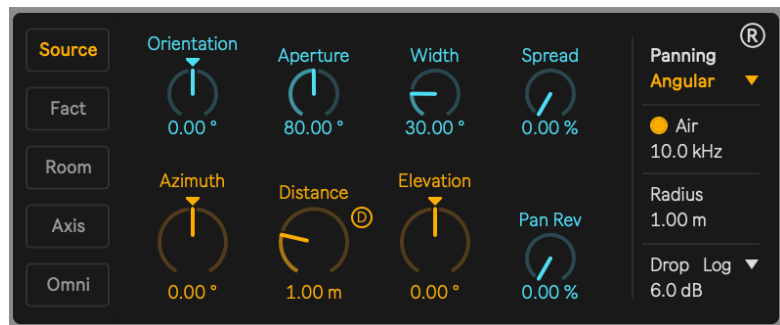
Output & (foldable) Routing sections:



Source & Room controls are organized in five panels, whose view can be selected using the tab on the left:

The Source tab lets you control the perceptual description of the acoustic quality of the source, its localization, orientation, directivity and radiation.

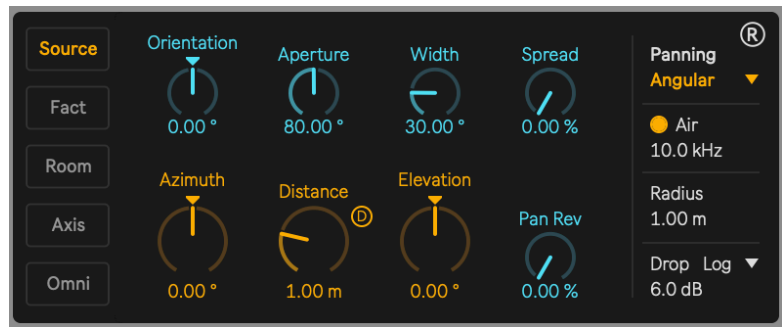
Settings controlling features such as panning type, attenuation law and simulation of air absorption can also be adjusted.



Parameters:

- "Azimuth" sets the angle (in degrees) of the sound source, measured toward the vertical axis, with 0° in front of the listener. This parameter can be graphically manipulated in the Panner window.
- "Distance" sets the apparent distance (in meters) of the sound source. When the sound source moves away from the listener, its energy decreases, according to the following attenuation law: the energy of the source is reduced by the value of the Drop parameter (default: 6dB) when the distance of the source is multiplied by 2. Maximum energy is reached when the source gets to the value of the Radius parameter (default: 1m). This parameter can be graphically manipulated in the Panner window.
- "Doppler" ("D" button) enables/disables a Doppler effect on the sound source. Doppler effect may be described as frequencies of a moving sound source shifting according to the variation of distance over time between the source and the listener.
- "Elevation" sets the elevation angle (in degrees) of the sound source. Elevation is 0° within XY plane, +90° on top, -90° bottom. This parameter can be graphically manipulated in the Panner window.
- "Orientation" sets the apparent orientation (in degrees) of the sound source, reproduced by spectral corrections of the direct sound. Variations of orientation are affected by the Aperture (directivity) parameter. This parameter can be graphically manipulated in the Panner window.
- "Aperture" sets the apparent radiation or directivity (in degrees) of the sound source, reproduced by spectral corrections of the direct sound. As the aperture decreases, the directivity of the sound source increases, affecting variations of the Orientation parameter. This parameter can be graphically manipulated in the Panner window.
- "Width" sets the width (in degrees) of the stereo image formed by the direct and early room effect sounds, which rotate together according to Azimuth and Elevation.
- "Spread" sets the amount of blurring (in percent) applied to the panning of the sound source. As the value is increased, the localization of the sound source decreases accordingly. The spreading law slightly differs depending on the selected panning type.

- "Pan Rev" sets the amount (in percent) of directionality of "cluster" reflections. While early reflections are panned together with the direct sound, cluster reflections are initially diffuse, and the late reverb is panned dead center. Increasing the value of Pan Rev results in a more directive global room effect.



- "Panning" lets you select the desired panning technique:
 - "Angular", or "vector-based" amplitude panning is recommended for precise localization of the sound source. [Read more about VBAP panning](#)
 - "Nearest", or "K nearest neighbour" panning is recommended for situations where no particular sweet spot is required. [Read more about KNN panning](#)
 - "Ambisonics", or "high order ambisonics" panning is recommended for better stability of the sound scene. [Read more about Ambisonics panning](#)

Note: The device performs a short fade-in/fade-out when the panning is changed, in order to avoid unwanted audio clicks or drops.

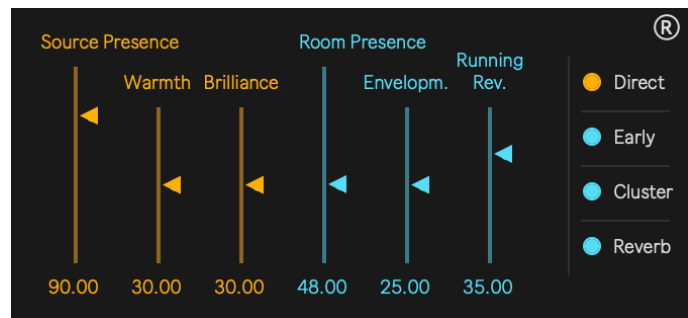
- "Air" enables/disables absorption filtering, which produces a frequency-cut simulating absorption of air, where high frequencies roll-off quicker than low-frequencies according to distance.
- "Air Freq" sets the roll-off frequency for air absorption filtering (in Herz).
- "Radius" sets the radius (in meters) of a virtual spheric "safety area" surrounding the listener. When the sound source comes closer to the listener, its energy progressively increases. When the source reaches the "radius sphere", its energy no longer increases. It is clipped. The "radius" parameter hence represents the minimum radius below which the sound level is limited.
- "Drop Mode" sets the type of attenuation (linear or logarithmic) set by the Drop parameter, which represents the slope of the attenuation law applied on the sound source according to distance setting.
- "Drop" represents the slope (in deciBels) of the attenuation law applied on the sound source according to distance setting. A 6dB drop means that the energy of the source is reduced by 6dB when the distance of the source is doubled. A logarithmic 6dB attenuation law corresponds to a natural attenuation law in free-field conditions.

Utility

Pressing the "R" ("Reset") button resets all parameters in this section to their default value.

The Fact tab ("Fact" for perceptual factors) lets you adjust parameters describing the acoustic quality in terms of mutually independent perceptual factors.

These perceptual factors are derived from psychoacoustic research on the characterization of the acoustic quality of concert halls. As a result of these studies, each perceptual factor is related to a measurable objective criterion.



This allows to reproduce the acoustic quality of an existing room, and the interaction of the sound source with the room. The perceptual factors are manipulated by means of sliders which are scaled to account for the average sensitivity of listeners with respect to the different factors.

The first 3 factors are perceived as characteristics of the source:

"Source Presence" sets the energy of direct sound and early room effect at a given distance. It is inter-connected with the Distance parameter. Therefore this parameter can't be automated, as the interaction with Distance would end up in an infinite loop of interactive levelling.

"Warmth" sets the variation of early sound at low frequencies.

"Brilliance" sets the variation of early sound at high frequencies.

The next 3 factors are perceptually associated to the room:

"Room Presence" sets the energy of later reflections (cluster) and reverberation.

"Envelopment" sets the energy of early room effect relative to direct sound.

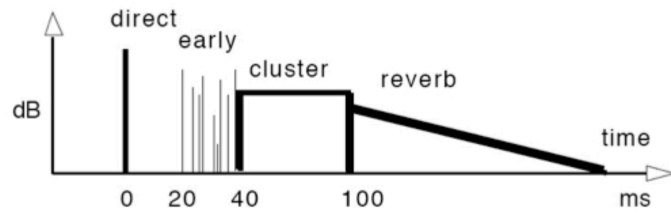
"Running Reverberance" sets the early sound's decay time. The term "reverberance" refers to the sensation that sounds are prolonged by the room reverberation. Late reverberance (in the Room tab) differs from Running Reverberance by the fact that it is essentially perceived during interruptions of the message radiated by the source. Running Reverberance, on the contrary, remains perceived during continuous music.

The different stages of the room effect can be enabled or disabled for further sound results:

- "Direct" enables/disables the direct sound.
- "Early" enables/disables early reflections.
- "Cluster" enables/disables later and diffuse reflections.
- "Reverb" enables/disables the reverberation sound.

Time structure of the room effect

The response of the Room module is divided into four time sections:



- **direct** : The direct sound is taken as the time reference (0 ms) for the description of the artificial room effect that follows it.
- **early** : This section contains the discrete early reflections, shared between the two sides signals of Room. The date and intensity of each reflection can be controlled individually.
- **cluster**: This section contains a denser pattern of diffuse later reflections which are equally shared between the surround signals.
- **reverb**: This section contains the late diffuse reverberation, divided into uncorrelated signals of equal energy sent to the surround outputs. The late reverberation decays exponentially with time according to the decay settings.

The Room tab lets you adjust the settings that define the reverberator.



- The decay time control sets the exponential decay rate of the late reverberation as a function of frequency. The decay time is measured in seconds and defined as the time it takes for the late reverberation to drop 60 dB below its initial level, after an interruption of the input signal. The decay time is controlled in the same way as an equalizer curve, either globally or in three separate frequency bands with controllable transition frequencies, and can be varied from 0.1s to 10s.
- "Room Size" sets the size of the room (in cubic meters). As the value is increased, early and cluster (diffuse) reflections get spread over time.
- "Offset" shifts the times (in milliseconds) of early, cluster and reverb reflections.
- "Early Shape" sets the distribution of the gains of early reflections. At low values, earlier reflections are louder than later reflections. At high values, later reflections are louder than earlier reflections.
- "Reverberance" sets the global reverberation decay time at mid-frequencies. The term "reverberance" refers to the sensation that sounds are prolonged by the room reverberation.
- the "Infinite" switch enables/disables (quasi) infinite reverberation effect.

- "Heaviness" sets the relative reverberation decay time at low frequencies.
- "Liveness" sets the relative reverberation decay time at high frequencies.
- "Freq Low" sets the low/mid reverberation crossover frequency (in Herz).
- "Freq High" sets the mid/high reverberation crossover frequency (in Herz).
- the "HD" switch, when engaged, doubles the number of internal channels of the artificial reverberator. This generates a denser reverb tail - i.e. more natural sounding reverb - at the expense of a higher CPU load. Engaging HD may be useful especially when dealing with a very long reverberation time or with very percussive sound.

Note: The device performs a short fade-in/fade-out when HD is changed, in order to avoid unwanted audio clicks or drops.

- "Air" enables/disables absorption filtering, which produces a frequency-cut simulating absorption of air, where high frequencies roll-off quicker than low-frequencies according to distance.
- "Air Freq" sets the roll-off frequency for air absorption filtering (in Herz).
- "Zoom": sets the zooming factor of the reverberator view.

Utilities

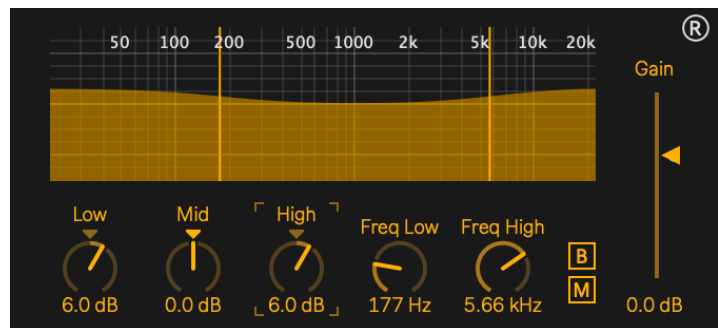
- pressing the "R" ("Reset") button resets all parameters in this section to their default value.
- pressing the "C" ("Copy") button copies all Room parameters values, to be pasted into another instance of the device.
- pressing the "P" ("Paste") button pastes a copy of Room parameters from another instance of the device.
- pressing the "S" ("Send") button sends all Room parameters values to any instance of the device present in the Live set.

Spectral equalizers

All spectral corrections are performed with the same signal module. This is a "double shelving filter" which allows to boost or cut three frequency bands separately and control the high and low transition frequencies. The filtering module is made of a second-order recursive filter with a particular method of computing the coefficients, in order to achieve symmetrical boost and cut curves (on a dB scale), as well as symmetrical response curves on a log frequency scale.

The Axis tab lets you adjust the spectrum image of the "axis" - or direct - sound, independently from the spectrum image of the reverberator. The "Axis" signal contains the average acoustic information scattered by the source in the direction of the listener.

- "Low" sets the gain of low frequencies (in deciBels).
- "Mid" sets the gain of mid frequencies (in deciBels).
- "High" sets the gain of high frequencies (in deciBels).
- "Freq Low" sets the low/mid crossover frequency (in Herz).
- "Freq High" sets the mid/high crossover frequency (in Herz).
- "Gain" sets the global energy (in deciBels) of the direct sound.
- the "B" ("Bypass") switch temporarily bypasses the filtering effect.
- the "M" ("Mute") switch temporarily disables the direct sound.

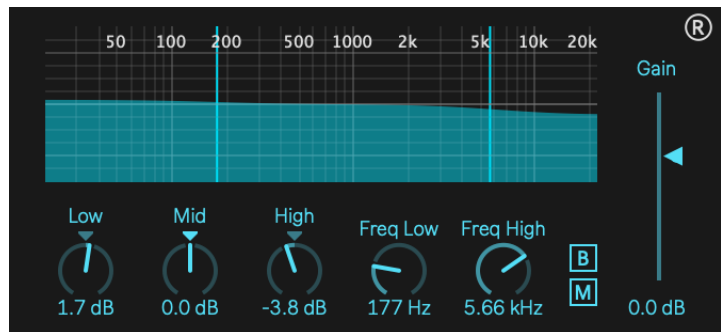


Utility

Pressing the "R" ("Reset") button resets all parameters in this section to their default value.

The Omni tab lets you adjust the spectrum image of the "omni" sound - or global room effect -, independently from the spectrum image of the direct sound. The filtering is applied to the global reverberation sound. The "Omni" signal contains the average acoustic information scattered by the source in all directions.

- "Low" sets the gain of low frequencies (in deciBels).
- "Mid" sets the gain of mid frequencies (in deciBels).
- "High" sets the gain of high frequencies (in deciBels).
- "Freq Low" sets the low/mid crossover frequency (in Herz).
- "Freq High" sets the mid/high crossover frequency (in Herz).
- "Gain" sets the global energy (in deciBels) of the room sound.
- the "B" ("Bypass") switch temporarily bypasses the filtering effect.
- the "M" ("Mute") switch temporarily disables the room sound.



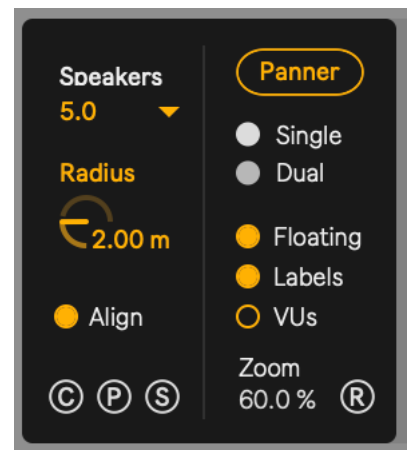
Utility

Pressing the "R" ("Reset") button resets all parameters in this section to their default value.

The Speakers panel lets you select a speakers configuration among a collection of presets corresponding to most popular setups, from simple quadriphonia to more complex 3D Dolby Atmos-compatible setups.

This section also lets you open a Panner window, from which the sound source can be displayed and easily manipulated within the speakers setup.

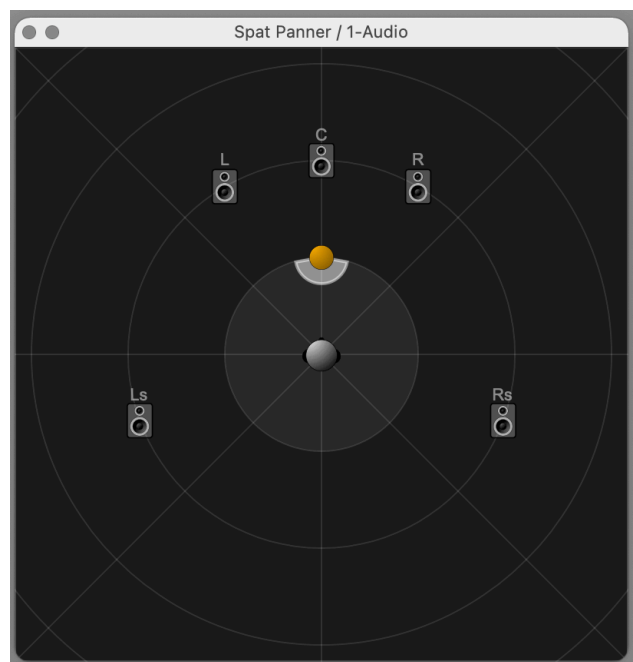
The "Speakers" menu lets you select a speaker setup among a collection of classic multichannel configurations. The device performs a short fade-in/fade-out when the setup is changed, in order to avoid unwanted audio clicks or drops.



The "Panner" button opens the Panner window. In the Panner window, select & drag the icon representing the sound source to set its position within the virtual room. Use a trackpad (with 2 fingers) or the mouse-wheel to control these settings:

- drag to zoom in and out
- alt-drag source to adjust orientation
- cmd-drag source to adjust aperture
- shift-drag source to adjust elevation

The Panner window can be freely resized for a more comfortable display.



"Radius" adjusts the global distance (in meters) between the listener and the speakers. By default, Radius is set to 2 meters.

"Align", when engaged, performs a gain and delay compensation of speaker channels, when all speakers are not equally distant from the listener position. The Align parameter is especially useful when a Custom configuration is in use (please see below).

"Layout" toggles the Panner layout between top ("Single") and top+front ("Dual") views. Top+front is only available with speaker configurations that have elevation.

"Floating" enables/disables the "always-on-top" option for the Panner window.

"Labels" enables/disables the display of speakers labels.

"VUs" enables/disables the display of speakers VU-meters in the panner window. Disabling VU-meters may spare a little CPU consumption.

"Zoom" adjusts the zooming factor.

Utilities

It's possible to define the speakers configuration only once - i.e. in one instance of the device - and share that configuration with other instances of the device.

- pressing the "C" ("Copy") button copies the speakers configuration and the Radius value, to be pasted into another instance of the device.
- pressing the "P" ("Paste") button pastes a copy of speakers configuration and of the Radius value from another instance of the device.
- pressing the "S" ("Send") button sends the speakers configuration and the Radius value to any instance of the device present in the Live set.
- pressing the white "R" ("Reset") button resets all parameters in this section to their default value.

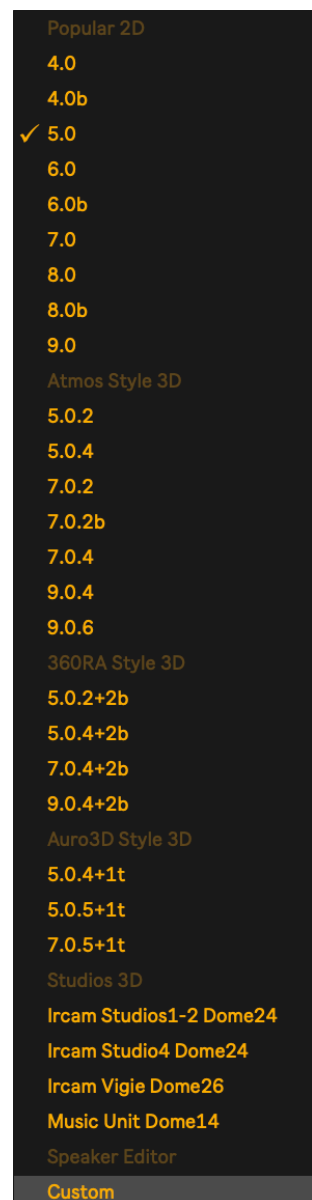
About the Custom preset

In case the standard presets do not correspond to your needs, or do not reflect the room in which you are working (studio, room...), you have the possibility to build your own loudspeaker configuration. This is achieved using the SPAT Speaker Editor device.

The SPAT Speaker Editor device is a utility that allows the customization of standard speaker configurations and the creation of new configurations. This device does not produce sound but can be inserted at any time on any track of a Live session. It can be used to easily share speaker setups with SPAT Spatial™, SPAT Room™, and SPAT Multiverb™ devices in a single live session.

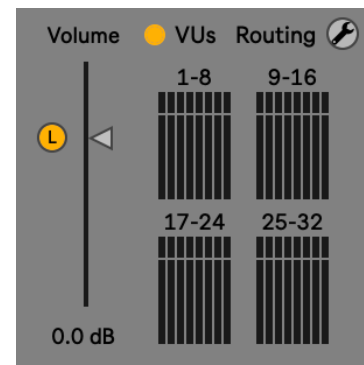
The speaker configuration you edit or create from the SPAT Speaker Editor device is stored in the custom preset slot, which can then be freely selected like any other standard preset.

Please read the SPAT Speaker Editor Documentation document to learn how to use the device.



The Output panel lets you adjust the output master level and monitor the audio outputs of the device, which can produce multichannel audio up to 32 channels.

- "Volume" adjusts the output gain (in deciBels)
- the "L" ("Limiter") switch enables/disables output level limiting. In some cases where strong limiting occurs - with, for instance, very long & dense reverberation - the output signal may become distorted at some point. In such case, you may want to disable the limiter and lower the output volume.
- the "VUs" switch enables/disables VU-meters. Disabling VU-meters may spare a little CPU consumption.
- the "Routing" tool toggles the display of the output routing panel.



The Routing panel lets you route audio stereo outputs from the device to the desired output, either direct outputs (DACs) or other Live tracks - just as you would route the output of regular Live tracks.

The panel has two views, A for channels from 1 to 16, and B for channels from 17 to 32.

Note that it's possible to route audio channels only as stereo pairs. So when working with a central speaker ("C") - such as in a 5.1 configuration - the device outputs a mono signal to the third channel, and leaves the fourth channel empty.

This also means that, in such situation like 5.1, 7.1 configurations, the LFE channel is not fed by the device. This rather is left to the user, or to the bass management of the monitoring system, if any.

It's possible to define the output routing only once - i.e. in one instance of the device - and share that routing with other instances of the device.

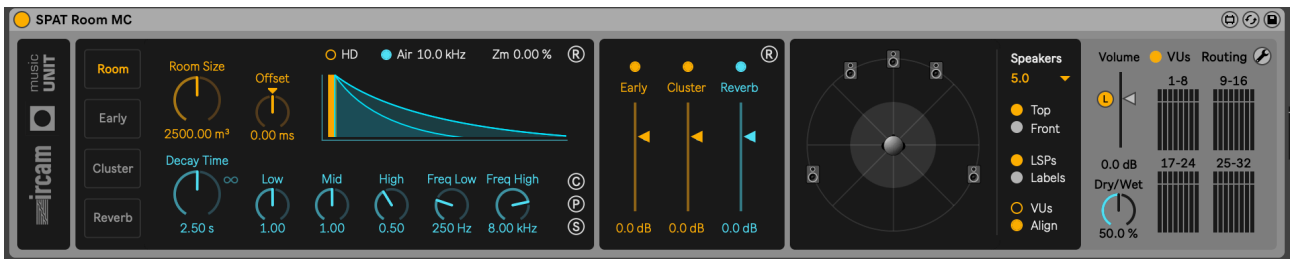


- pressing the "C" ("Copy") button copies the routing, to be pasted into another instance of the device.
- pressing the "P" ("Paste") button pastes a copy of the routing from another instance of the device.
- pressing the "S" ("Send") button sends the routing to any instance of the device present in the Live set.

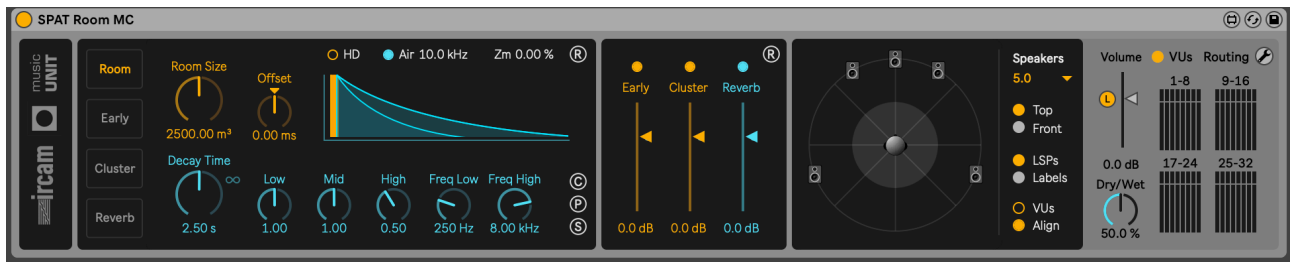
SPAT Room MC device

SPAT Room MC (MC for "multichannel") is a multichannel virtual room processor that proposes a convincing reverberation effect in a 2D or 3D virtual or real auditory space. It can be used just like a classic reverberator - typically available from an auxiliary Return track, for a global room effect applied to a mix.

The device can feed sound systems with up to 32 satellite speakers, and lets you select a speakers configuration among a collection of pre-defined presets corresponding to most popular speakers setups, from simple quadraphonia to standard 5.1 or 7.1, up to more complex 3D Dolby Atmos-compatible setups like 7.1.4.

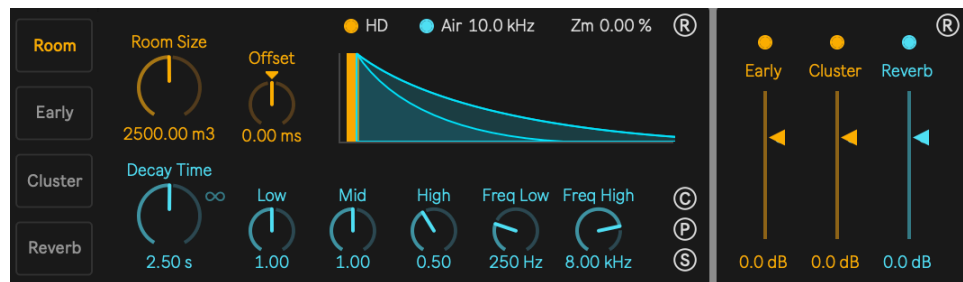


Structure of the user interface

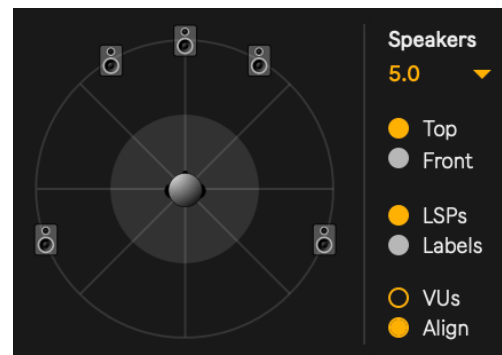


The user interface is divided in three main sections:

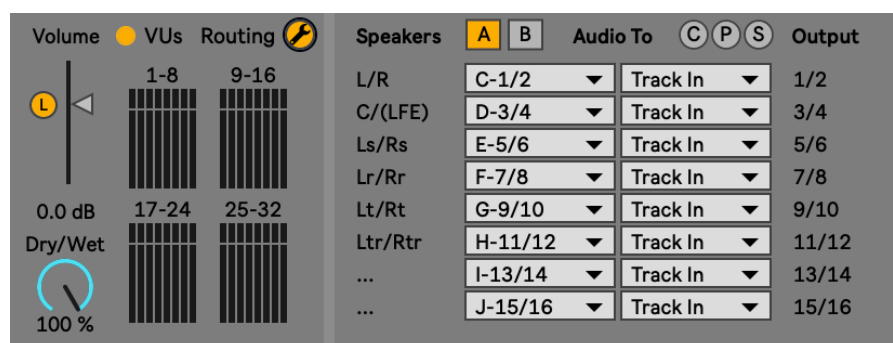
Room editor and
Mixing controls:



Speakers section:



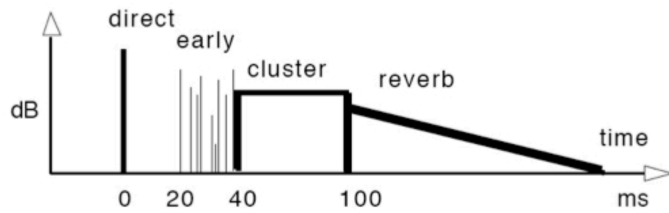
Output & (foldable)
Routing sections:



Time structure of the room effect

The response of the Room module is divided into four time sections:

- direct : The direct sound is taken as the time reference (0 ms) for the description of the artificial room effect that follows it.
- early : This section contains the discrete early reflections, shared between the two sides signals of Room. The delay time and intensity of each reflection can be controlled individually.
- cluster: This section contains a denser pattern of diffuse later reflections which are equally shared between the surround signals.
- reverb: This section contains the late diffuse reverberation, divided into uncorrelated signals of equal energy sent to the surround outputs. The late reverberation decays exponentially with time according to the decay settings.

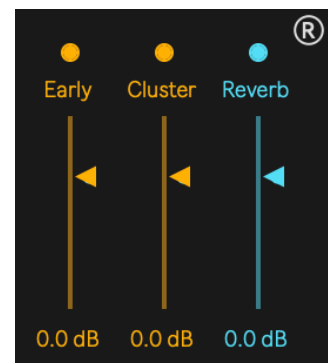


The Mixing panel lets you enable/disable and adjust the respective levels of the different stages of the reverberator.

Note that the direct sound is handled by the Dry/Wet dial in the Output section.

Utility

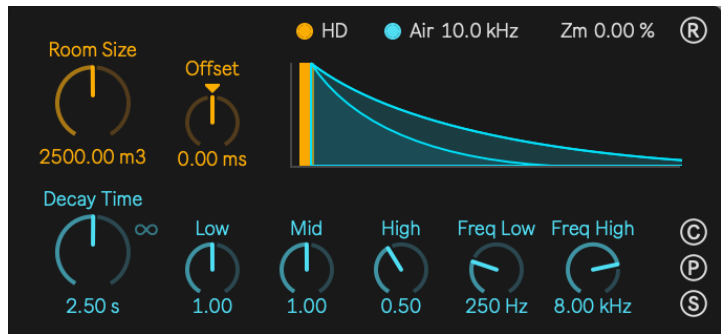
Pressing the "R" ("Reset") button resets all parameters in this section to their default value.



The Room tab lets you adjust the settings that define the reverberator.

The decay time control sets the exponential decay rate of the late reverberation as a function of frequency. The decay time is measured in seconds and defined as the time it takes for the late reverberation to drop 60 dB below its

initial level, after an interruption of the input signal. The decay time is controlled in the same way as an equalizer curve, either globally or in three separate frequency bands with controllable transition frequencies, and can be varied from 0.5s to 30s.



- "Room Size" sets the size of the room (in cubic meters). As the value is increased, early and cluster (diffuse) reflections get spread over time.
- "Offset" shifts the times (in milliseconds) of early, cluster and reverb reflections..
- "Decay time" sets the global reverberation decay time.
- the "Infinite" switch enables/disables (quasi) infinite reverberation effect.
- "Low" sets the relative reverberation decay time at low frequencies.
- "Mid" sets the relative reverberation decay time at mid frequencies.
- "High" sets the relative reverberation decay time at high frequencies.
- "Freq Low" sets the low/mid reverberation crossover frequency (in Herz).
- "Freq High" sets the mid/high reverberation crossover frequency (in Herz).
- the "HD" switch, when engaged, doubles the number of internal channels of the artificial reverberator. This generates a denser reverb tail - i.e. more natural sounding reverb - at the expense of a higher CPU load. Engaging HD may be useful especially when dealing with a very long reverberation time or with very percussive sound.

Note: The device performs a short fade-in/fade-out when HD is changed, in order to avoid unwanted audio clicks or drops.

- "Air" enables/disables absorption filtering, which produces a frequency-cut simulating absorption of air, where high frequencies roll-off quicker than low-frequencies according to distance.
- "Air Freq" sets the roll-off frequency for air absorption filtering (in Herz).
- "Zoom": sets the zooming factor of the reverberator view.

Utilities

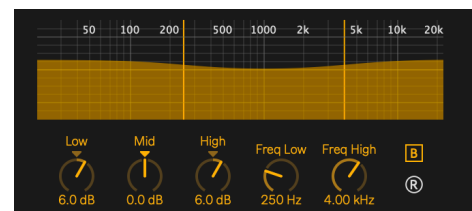
- pressing the "R" ("Reset") button resets all parameters in this section to their default value.
- pressing the "C" ("Copy") button copies all Room parameters values, to be pasted into another instance of the device.
- pressing the "P" ("Paste") button pastes a copy of Room parameters from another instance of the device.
- pressing the "S" ("Send") button sends all Room parameters values to any instance of the device present in the Live set.

Spectral equalizers

All spectral corrections are performed with the same signal module. This is a "double shelving filter" which allows to boost or cut three frequency bands separately and control the high and low transition frequencies. The filtering module is made of a second-order recursive filter with a particular method of computing the coefficients, in order to achieve symmetrical boost and cut curves (on a dB scale), as well as symmetrical response curves on a log frequency scale.

The Early tab lets you adjust the spectrum image of the early reflections.

- "Low" sets the gain of low frequencies (in deciBels).
- "Mid" sets the gain of mid frequencies (in deciBels).
- "High" sets the gain of high frequencies (in deciBels).
- "Freq Low" sets the low/mid crossover frequency (in Herz).
- "Freq High" sets the mid/high crossover frequency (in Herz).
- the "B" ("Bypass") switch temporarily bypasses the filtering effect.

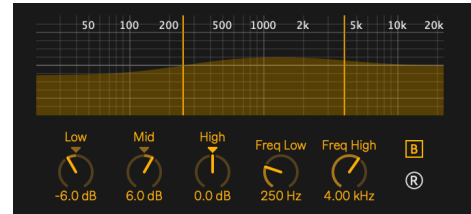


Utility:

pressing the "R" ("Reset") button resets all parameters in this section to their default value.

The Cluster tab lets you adjust the spectrum image of the cluster (diffuse) reflections.

- "Low" sets the gain of low frequencies (in deciBels).
- "Mid" sets the gain of mid frequencies (in deciBels).
- "High" sets the gain of high frequencies (in deciBels).
- "Freq Low" sets the low/mid crossover frequency (in Herz).
- "Freq High" sets the mid/high crossover frequency (in Herz).
- the "B" ("Bypass") switch temporarily bypasses the filtering effect.

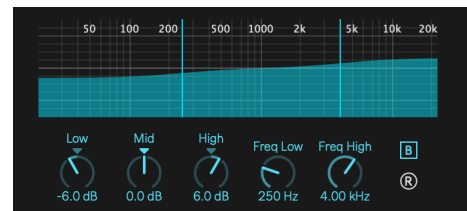


Utility

pressing the "R" ("Reset") button resets all parameters in this section to their default value.

The Reverb tab lets you adjust the spectrum image of the late reverberation.

- "Low" sets the gain of low frequencies (in deciBels).
- "Mid" sets the gain of mid frequencies (in deciBels).
- "High" sets the gain of high frequencies (in deciBels).
- "Freq Low" sets the low/mid crossover frequency (in Herz).
- "Freq High" sets the mid/high crossover frequency (in Herz).
- the "B" ("Bypass") switch temporarily bypasses the filtering effect.

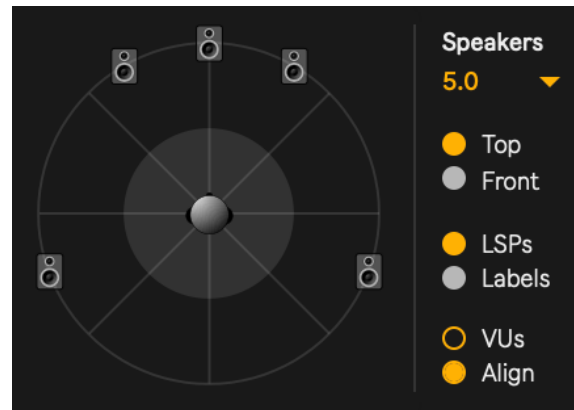


Utility

pressing the "R" ("Reset") button resets all parameters in this section to their default value.

The Speakers panel lets you select a speakers configuration among a collection of presets corresponding to most popular setups, from simple quadriphonia to more complex 3D Dolby Atmos-compatible setups.

- the "Speakers" menu selects a speaker setup among a collection of classic multichannel configurations. The device performs a short fade-in/fade-out when the setup is changed, in order to avoid unwanted audio clicks or drops.
- "Layout" toggles the display's layout between Top and Front views.
- "Display" toggles the speakers and speakers-labels views.
- "VUs" enables/disables the display of speakers VU-meters in the panner window. Disabling VU-meters may spare a little CPU consumption.
- "Align", when engaged, performs a gain and delay compensation of speaker channels, when all speakers are not equally distant from the listener position. The Align parameter is especially useful when a Custom configuration is in use (please see below).



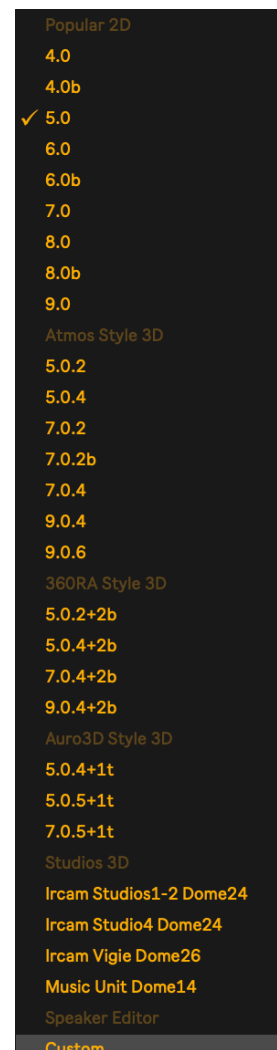
About the Custom preset

In case the standard presets do not correspond to your needs, or do not reflect the room in which you are working (studio, room...), you have the possibility to build your own loudspeaker configuration. This is achieved using the SPAT Speaker Editor device.

The SPAT Speaker Editor device is a utility that allows the customization of standard speaker configurations and the creation of new configurations. This device does not produce sound but can be inserted at any time on any track of a Live session. It can be used to easily share speaker setups with SPAT Spatial™, SPAT Room™, and SPAT Multiverb™ devices in a single live session.

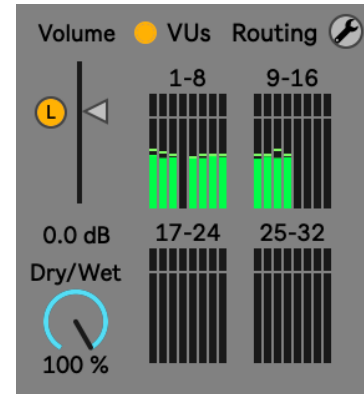
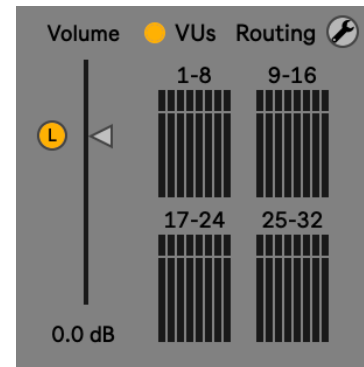
The speaker configuration you edit or create from the SPAT Speaker Editor device is stored in the custom preset slot, which can then be freely selected like any other standard preset.

Please read the SPAT Speaker Editor Documentation document to learn how to use the device.



The Output panel lets you adjust the output master level and monitor the audio outputs of the device, which can produce multichannel audio up to 32 channels.

- "Volume" adjusts the output gain (in deciBels)
- the "L" ("Limiter") switch enables/disables output level limiting. In some cases where strong limiting occurs - with, for instance, very long & dense reverberation - the output signal may become distorted at some point. In such case, you may want to disable the limiter and lower the output volume.
- the "VUs" switch enables/disables VU-meters. Disabling VU-meters may spare a little CPU consumption.
- the "Routing" tool toggles the display of the output routing panel.



The Routing panel lets you route audio stereo outputs from the device to the desired output, either direct outputs (DACs) or other Live tracks - just as you would route the output of regular Live tracks.

The panel has two views, A for channels from 1 to 16, and B for channels from 17 to 32.

Note that it's possible to route audio channels only as stereo pairs. So when working with a central speaker ("C") - such as in a 5.1 configuration - the device outputs a mono signal to the third channel, and leaves the fourth channel empty.

Speakers	A	B	Audio To	C	P	S	Output
L/R	C-1/2		Track In				1/2
C/(LFE)	D-3/4		Track In				3/4
Ls/Rs	E-5/6		Track In				5/6
Lr/Rr	F-7/8		Track In				7/8
Lt/Rt	G-9/10		Track In				9/10
Ltr/Rtr	H-11/12		Track In				11/12
...	I-13/14		Track In				13/14
...	J-15/16		Track In				15/16

This also means that, in such situation like 5.1, 7.1 configurations, the LFE channel is not fed by the device. This rather is left to the user, or to the bass management of the monitoring system, if any.

It's possible to define the output routing only once - i.e. in one instance of the device - and share that routing with other instances of the device.

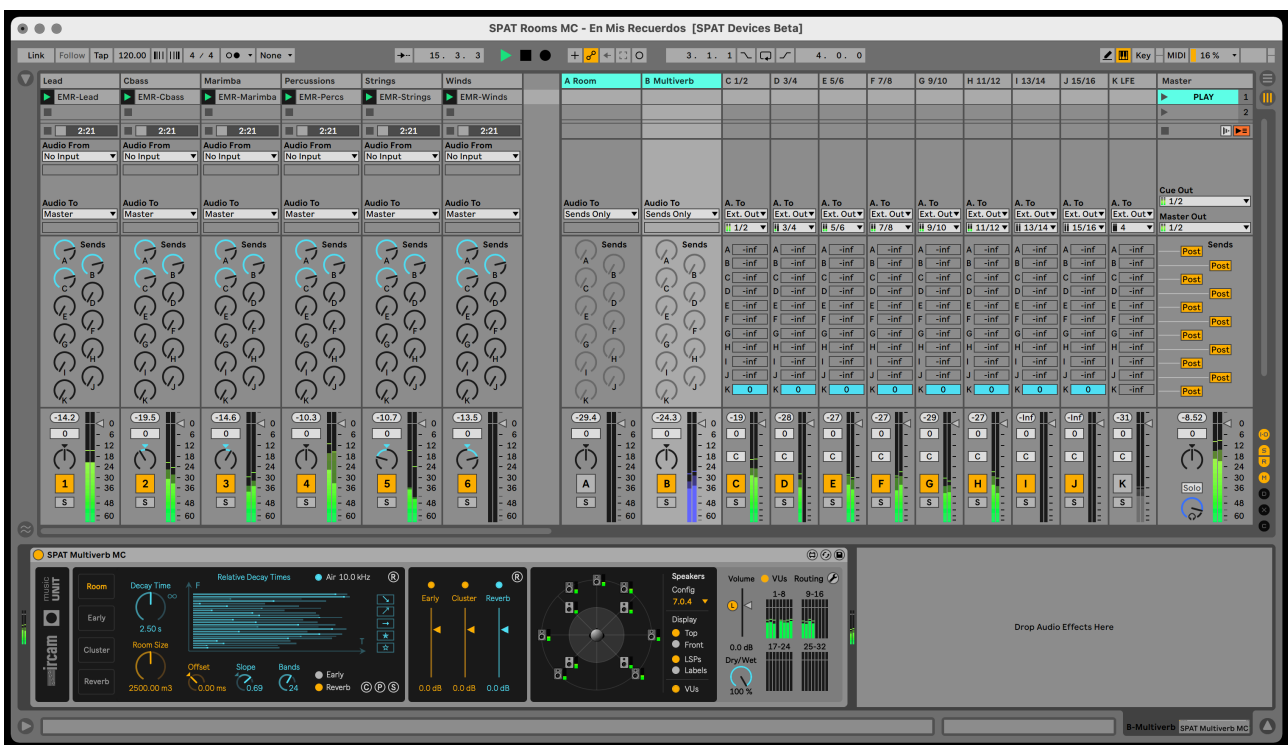
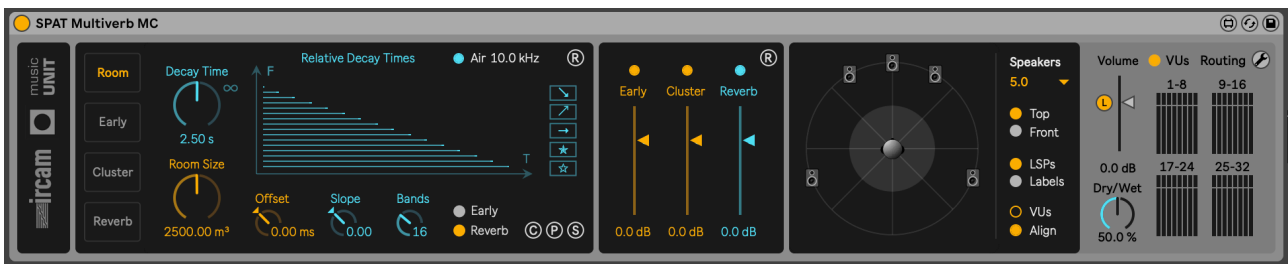
- pressing the "C" ("Copy") button copies the routing, to be pasted into another instance of the device.
- pressing the "P" ("Paste") button pastes a copy of the routing from another instance of the device.
- pressing the "S" ("Send") button sends the routing to any instance of the device present in the Live set.

SPAT Multiverb MC

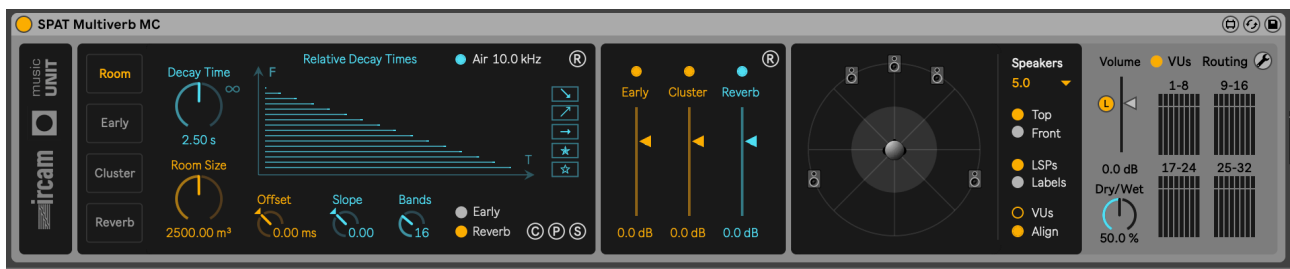
SPAT Multiverb MC (MC for "multichannel") is a multi-band version of the virtual room processor that powers the SPAT Spatial MC and SPAT Room MC devices. The main difference with the SPAT Room MC device is the possibility to adjust the reverberation decay time using up to 30 frequency bands separately, thus allowing the design of custom reverberation sounds.

The device can feed sound systems with up to 32 satellite speakers, and lets you select a speakers configuration among a collection of presets corresponding to most popular speakers setups, from simple quadriphonia to standard 5.1 or 7.1, up to 3D Dolby Atmos-compatible setups like 7.1.4.

The device can be used just like a classic reverberator - typically available from an auxiliary Return track, for a global spatial room effect applied to a mix.

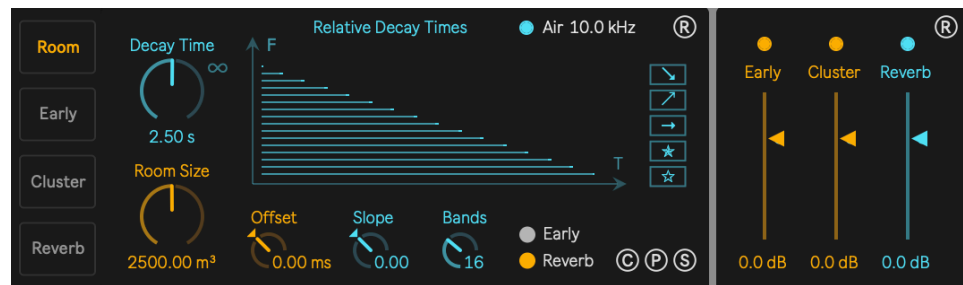


Structure of the user interface

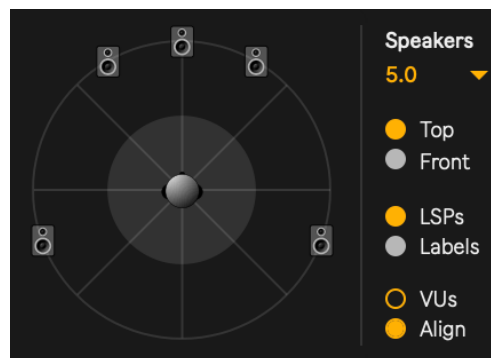


The user interface is divided in three main sections:

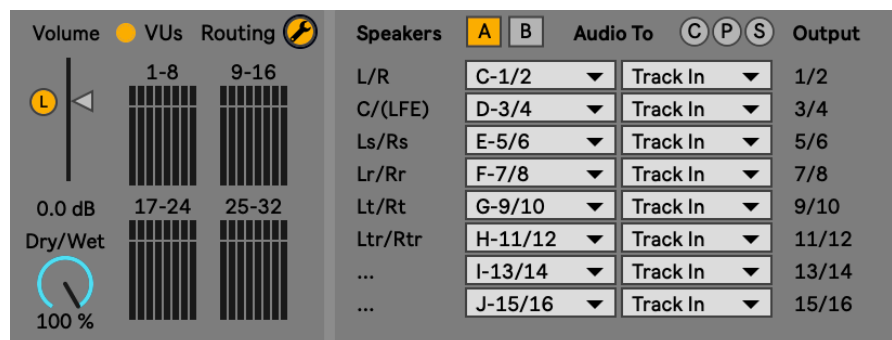
Room editor and
Mixing controls:



Speakers section:



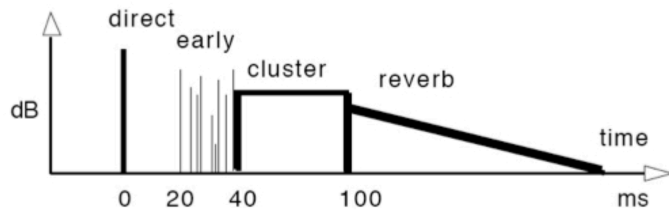
Output & (foldable)
Routing sections:



Time structure of the room effect

The response of the Room module is divided into four time sections:

- direct : The direct sound is taken as the time reference (0 ms) for the description of the artificial room effect that follows it.
- early : This section contains the discrete early reflections, shared between the two sides signals of Room. The delay time and intensity of each reflection can be controlled individually.
- cluster: This section contains a denser pattern of diffuse later reflections which are equally shared between the surround signals.
- reverb: This section contains the late diffuse reverberation, divided into uncorrelated signals of equal energy sent to the surround outputs. The late reverberation decays exponentially with time according to the decay settings.

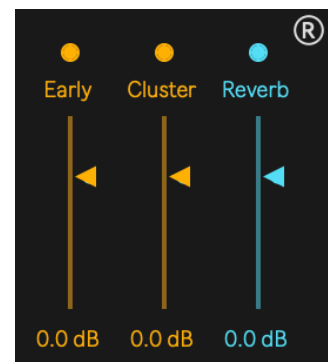


The Mixing panel lets you enable/disable and adjust the respective levels of the different stages of the reverberator.

Note that the direct sound is handled by the Dry/Wet dial in the Output section.

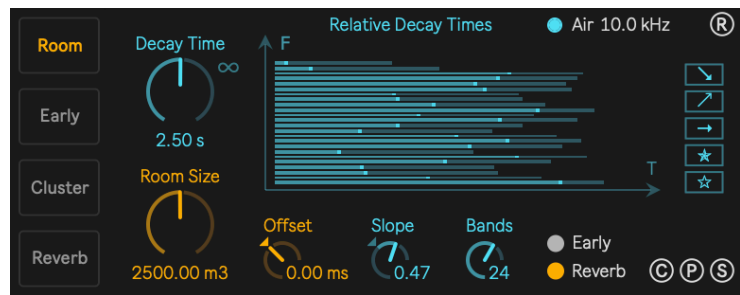
Utility

Pressing the "R" ("Reset") button resets all parameters in this section to their default value.



The Room tab lets you adjust the settings that define the reverberator.

The Decay Time control sets the average exponential decay rate of the global late reverberation as a function of frequency.



The Relative Decay Times panel lets you draw relative decays for several frequency bands. The number of bands is defined by the Bands parameter. Holding the shift key while drawing lets you adjust the value of one single band. Note that the device performs a short fade-in/fade-out when the Bands parameter is changed, in order to avoid unwanted audio clicks or drops.

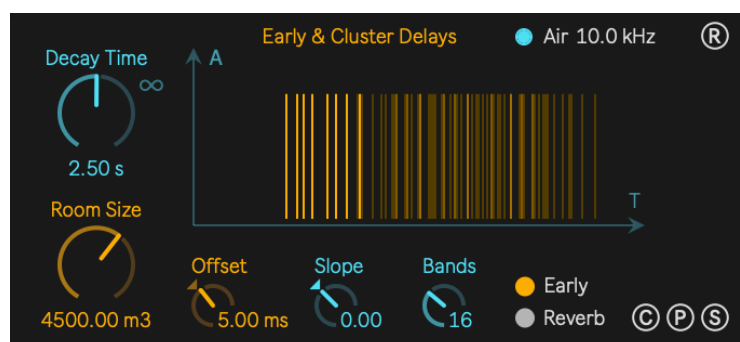
A relative decay time corresponds to the global decay time when the slider is set at its middle position. Dragging the slider left will decrease the decay time, and dragging the slider right will increase the decay time up to two times the global decay time.

Using the rightmost tab allows to set the sliders values all at once:

- the downward arrow sorts sliders up to down
- the upward arrow sorts sliders down to up
- the horizontal arrow sets all sliders to the global decay time value (mid position)
- the colored star triggers random values
- the transparent star triggers minimum or maximum values randomly

The Slope parameter lets you expand or compress the actual slider values exponentially.

The Early/Reverb switch toggles the Relative Decay Times view to the Early & Cluster Delays view:



- "Room Size" sets the size of the room (in cubic meters). As the value is increased, early and cluster (diffuse) reflections get spread over time.
- "Offset" shifts the times (in milliseconds) of early, cluster and reverb reflections..
- "Air" enables/disables absorption filtering, which produces a frequency-cut simulating absorption of air, where high frequencies roll-off quicker than low-frequencies according to distance.
- "Air Freq" sets the roll-off frequency for air absorption filtering (in Herz).

Utilities

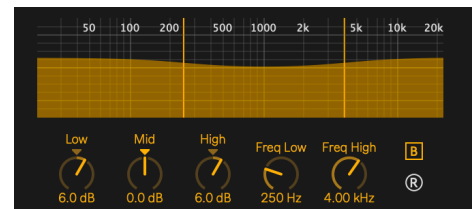
- pressing the "R" ("Reset") button resets all parameters in this section to their default value.
- pressing the "C" ("Copy") button copies all Room parameters values, to be pasted into another instance of the device.
- pressing the "P" ("Paste") button pastes a copy of Room parameters from another instance of the device.
- pressing the "S" ("Send") button sends all Room parameters values to any instance of the device present in the Live set.

Spectral equalizers

All spectral corrections are performed with the same signal module. This is a "double shelving filter" which allows to boost or cut three frequency bands separately and control the high and low transition frequencies. The filtering module is made of a second-order recursive filter with a particular method of computing the coefficients, in order to achieve symmetrical boost and cut curves (on a dB scale), as well as symmetrical response curves on a log frequency scale.

The Early tab lets you adjust the spectrum image of the early reflections.

- "Low" sets the gain of low frequencies (in deciBels).
- "Mid" sets the gain of mid frequencies (in deciBels).
- "High" sets the gain of high frequencies (in deciBels).
- "Freq Low" sets the low/mid crossover frequency (in Herz).
- "Freq High" sets the mid/high crossover frequency (in Herz).
- the "B" ("Bypass") switch temporarily bypasses the filtering effect.

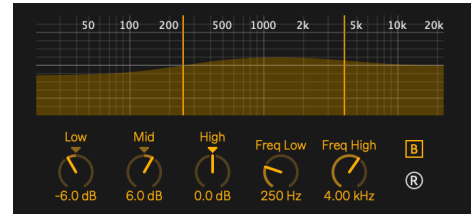


Utility

pressing the "R" ("Reset") button resets all parameters in this section to their default value.

The Cluster tab lets you adjust the spectrum image of the cluster (diffuse) reflections.

- "Low" sets the gain of low frequencies (in deciBels).
- "Mid" sets the gain of mid frequencies (in deciBels).
- "High" sets the gain of high frequencies (in deciBels).
- "Freq Low" sets the low/mid crossover frequency (in Herz).
- "Freq High" sets the mid/high crossover frequency (in Herz).
- the "B" ("Bypass") switch temporarily bypasses the filtering effect.

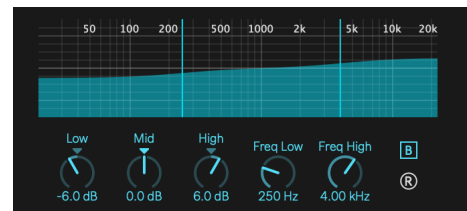


Utility

pressing the "R" ("Reset") button resets all parameters in this section to their default value.

The Reverb tab lets you adjust the spectrum image of the late reverberation.

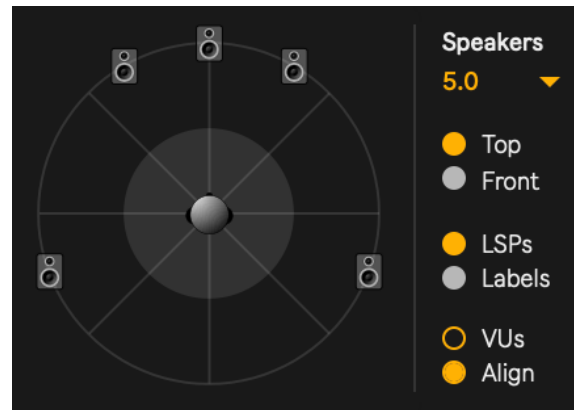
- "Low" sets the gain of low frequencies (in deciBels).
- "Mid" sets the gain of mid frequencies (in deciBels).
- "High" sets the gain of high frequencies (in deciBels).
- "Freq Low" sets the low/mid crossover frequency (in Herz).
- "Freq High" sets the mid/high crossover frequency (in Herz).
- the "B" ("Bypass") switch temporarily bypasses the filtering effect.



Utility

pressing the "R" ("Reset") button resets all parameters in this section to their default value.

The Speakers panel lets you select a speakers configuration among a collection of presets corresponding to most popular setups, from simple quadraphonia to more complex 3D Dolby Atmos-compatible setups.



- the "Speakers" menu selects a speaker setup among a collection of classic multichannel configurations. The device performs a short fade-in/fade-out when the setup is changed, in order to avoid unwanted audio clicks or drops.
- "Layout" toggles the display's layout between Top and Front views.
- "Display" toggles the speakers and speakers-labels views.
- "VUs" enables/disables the display of speakers VU-meters in the panner window. Disabling VU-meters may spare a little CPU consumption.
- "Align", when engaged, performs a gain and delay compensation of speaker channels, when all speakers are not equally distant from the listener position. The Align parameter is especially useful when a Custom configuration is in use (please see below).

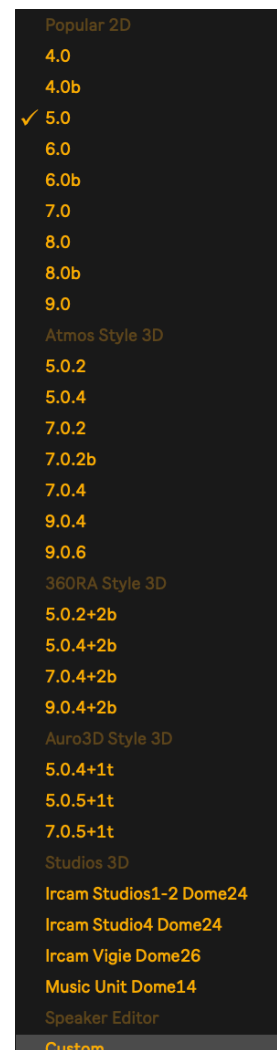
About the Custom preset

In case the standard presets do not correspond to your needs, or do not reflect the room in which you are working (studio, room...), you have the possibility to build your own loudspeaker configuration. This is achieved using the SPAT Speaker Editor device.

The SPAT Speaker Editor device is a utility that allows the customization of standard speaker configurations and the creation of new configurations. This device does not produce sound but can be inserted at any time on any track of a Live session. It can be used to easily share speaker setups with SPAT Spatial™, SPAT Room™, and SPAT Multiverb™ devices in a single live session.

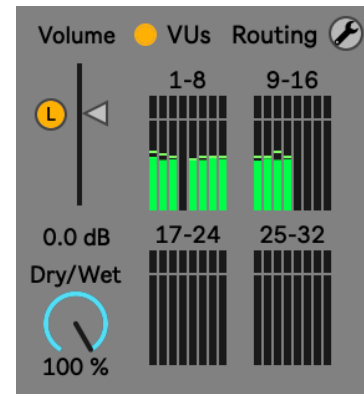
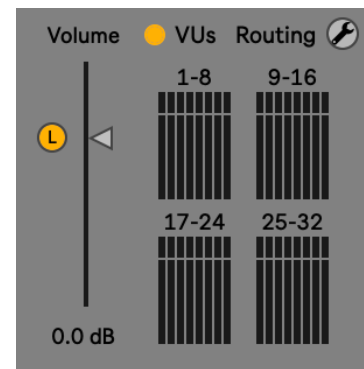
The speaker configuration you edit or create from the SPAT Speaker Editor device is stored in the custom preset slot, which can then be freely selected like any other standard preset.

Please read the SPAT Speaker Editor Documentation document to learn how to use the device.



The Output panel lets you adjust the output master level and monitor the audio outputs of the device, which can produce multichannel audio up to 32 channels.

- "Volume" adjusts the output gain (in deciBels)
- the "L" ("Limiter") switch enables/disables output level limiting. In some cases where strong limiting occurs - with, for instance, very long & dense reverberation - the output signal may become distorted at some point. In such case, you may want to disable the limiter and lower the output volume.
- the "VUs" switch enables/disables VU-meters. Disabling VU-meters may spare a little CPU consumption.
- the "Routing" tool toggles the display of the output routing panel.



The Routing panel lets you route audio stereo outputs from the device to the desired output, either direct outputs (DACs) or other Live tracks - just as you would route the output of regular Live tracks.

The panel has two views, A for channels from 1 to 16, and B for channels from 17 to 32.

Note that it's possible to route audio channels only as stereo pairs. So when working with a central speaker ("C") - such as in a 5.1 configuration - the device outputs a mono signal to the third channel, and leaves the fourth channel empty.

Speakers	A	B	Audio To	C	P	S	Output
L/R	C-1/2		Track In				1/2
C/(LFE)	D-3/4		Track In				3/4
Ls/Rs	E-5/6		Track In				5/6
Lr/Rr	F-7/8		Track In				7/8
Lt/Rt	G-9/10		Track In				9/10
Ltr/Rtr	H-11/12		Track In				11/12
...	I-13/14		Track In				13/14
...	J-15/16		Track In				15/16

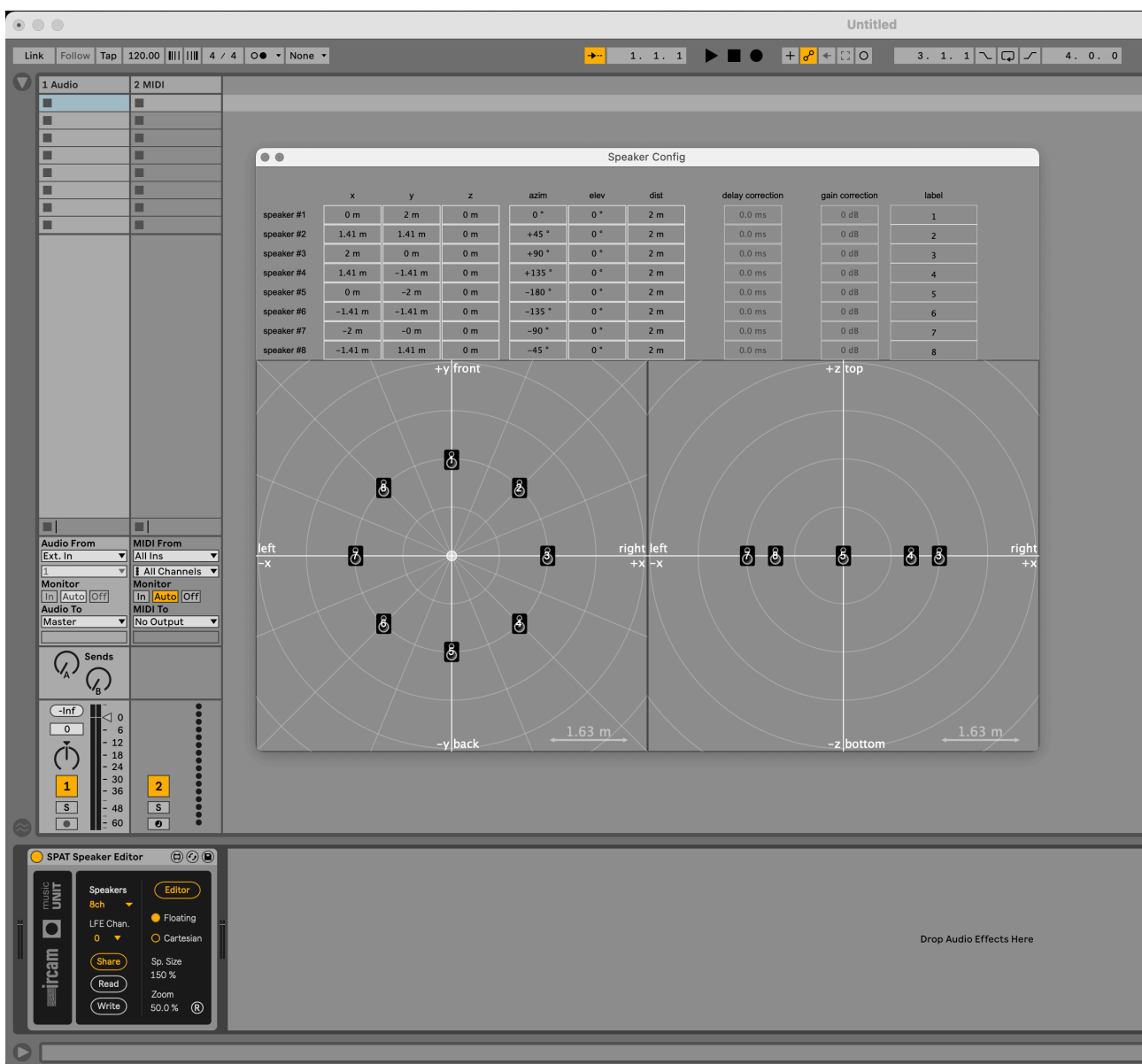
This also means that, in such situation like 5.1, 7.1 configurations, the LFE channel is not fed by the device. This rather is left to the user, or to the bass management of the monitoring system, if any.

It's possible to define the output routing only once - i.e. in one instance of the device - and share that routing with other instances of the device.

- pressing the "C" ("Copy") button copies the routing, to be pasted into another instance of the device.
- pressing the "P" ("Paste") button pastes a copy of the routing from another instance of the device.
- pressing the "S" ("Send") button sends the routing to any instance of the device present in the Live set.

SPAT Speaker Editor device

The SPAT Speaker Editor device is a utility that allows the customization of standard speaker configurations and the creation of new configurations. This device does not produce sound but can be inserted at any time on any track of a Live session. It can be used to easily share speaker setups with the SPAT Spatial MC, SPAT Room MC and SPAT Multiverb MC devices in a same Live session.



- **the Speakers menu** lets you select a speakers configuration among a collection of presets corresponding to most popular setups, from simple quadriphonia to more complex 3D Dolby Atmos-compatible setups.

- the "LFE Chan." menu lets you select whether and where a dummy LFE channel is inserted in the speaker configuration. This is useful when a central speaker is used - typically in setups like 5.1 or 7.1. As Live lets you route audio only as stereo pairs, if a "Center" mono channel is used, it is sometimes easier to insert an empty channel to form and route a "C/LFE" stereo pair. LFE channel in 5.1 or 7.1 setups is often set to channel 4. Setting the value to 0 removes the dummy channel. Note that SPAT devices don't provide integrated bass management.



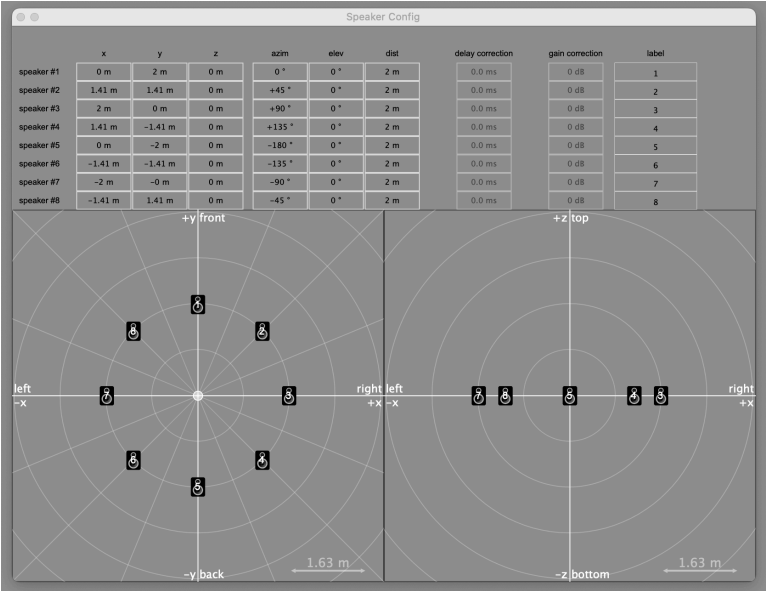
- Clicking the "Editor" button opens the Speaker Editor window.
- "Floating" enables/disables the "always-on-top" option for the Editor window.
- "Cartesian" toggles the grid type from polar to cartesian display.
- "Sp. Size" lets you resize the speakers icons
- "Zoom" adjusts the zooming factor.
- the "Share" button sends the current speaker configuration to all instances of SPAT Spatial MC, SPAT Room MC and SPAT Multiverb MC devices present in the Live set, into their "Custom" speakers preset slot.
- the "Read" button opens a dialog box from which you can select a (compatible) textual speaker configuration file that was previously exported
- the "Write" button opens a dialog box from which you can export the current speaker configuration as a readable text file.

Circular 2D
4ch
5ch
6ch
7ch
✓ 8ch
9ch
10ch
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17ch
18ch
19ch
20ch
21ch
22ch
23ch
24ch
25ch
26ch
27ch
28ch
29ch
30ch
31ch
32ch
Popular 2D
4.0
4.0b
5.0
6.0
6.0b
7.0
8.0
8.0b
9.0
Atmos Style 3D
5.0.2
5.0.4
7.0.2
7.0.2b
7.0.4
9.0.4
9.0.6
360RA Style 3D
5.0.2+2b
5.0.4+2b
7.0.4+2b
9.0.4+2b
Auro3D Style 3D
5.0.4+1t
5.0.5+1t
7.0.5+1t
Studios 3D
Ircam Studios1-2 Dome24
Ircam Studio4 Dome24
Ircam Vigie Dome26
Music Unit Dome14

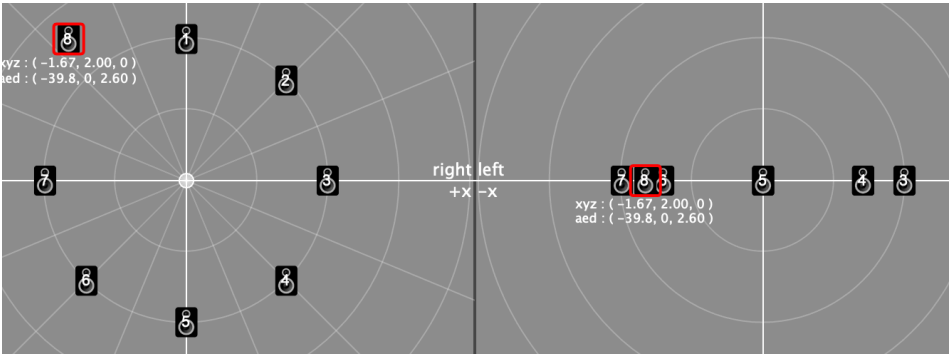
The **Editor window** lets you customize the speaker configuration that is selected, before sending it to the SPAT MC devices present in the Live session.

The upper panel displays the positions of the speakers, both in polar (azimuth, elevation, distance) and cartesian (x, y and z) modes.

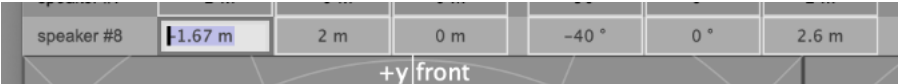
The two lower panels display the speakers positions from both top and front views.



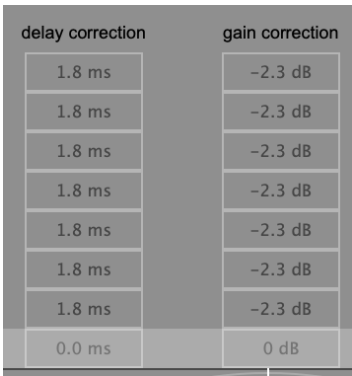
Move a speaker in the lower panel to quickly adjust its position.



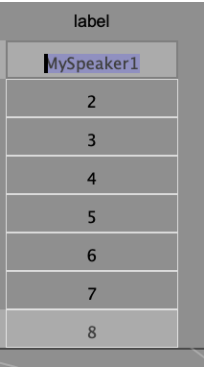
Refine the position by entering values in the upper panel.



Notice that, if speakers are not equidistant from the listener position, gain and delay adjustments for each speaker are calculated accordingly. These settings can be integrated in the SPAT Spatial MC, SPAT Room MC and SPAT Multiverb MC devices, if their Align setting is enabled in the Speakers pane. This can be useful for more accurate panning and sound image.

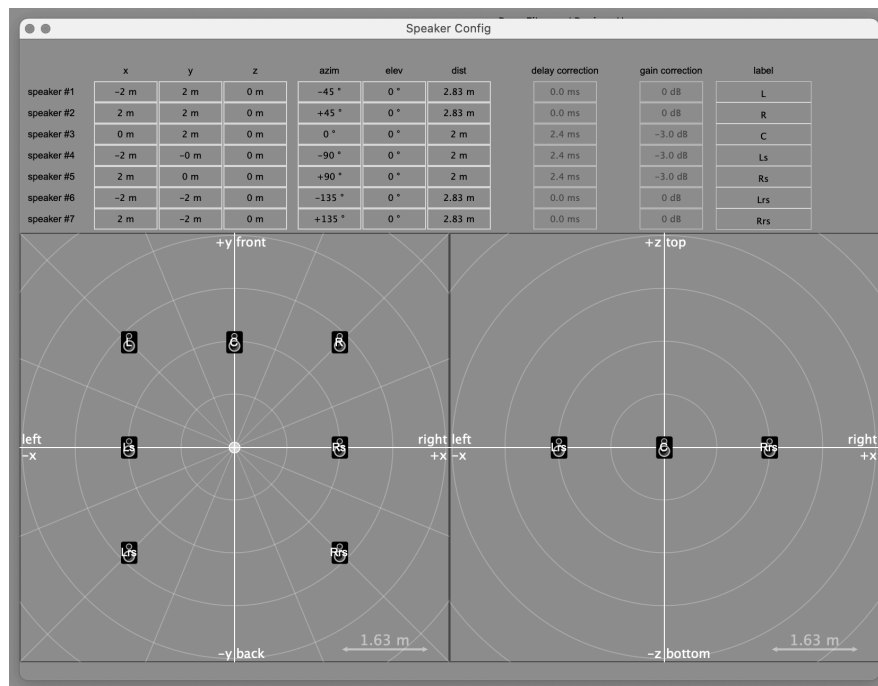


You also may want to rename speakers:



Once the configuration is ready, click the "Share" button to send it to all present instances of SPAT MC devices.

For instance, a "7ch" circular configuration which was edited to form a rectangular configuration:



... would result as this Custom configuration in all present SPAT MC devices:



Notice that in the present case, time and gain alignment are required, since all speakers are not equidistant from the listener position. Also notice that a dummy "LFE" channel was inserted in output channel 4, in order to form a stereo pair with the central channel and facilitate the (stereo) output routing:

