

# Waves S360° Panner, Imager

## Software Audio Processors

### User's Guide



## S360° Panner



## S360° Imager



# Introduction and Overview

Introducing **Waves S360°**, a Surround Panning and Imaging tool for 5 or 5.1 channels. It offers an alternative to surround X/Y panners, allowing better control of Phantom images, and providing better localization as well as an enhanced sweet spot. The **S360° Panner** lets you set the *Rotation* and *Width* for a Mono, Stereo, 5-channel or 5.1-channel, Surround source in the surround mix.

The **S360° Imager** is an enhanced panner, adding *Room Model Early Reflections* for distance panning and *Shuffling* for enhanced low frequency width. These tools assure you get the flexibility and control you need for creating both spatial and discrete images in the common 5-channel and 5.1-channel formats, providing the best translation to the typical target playback scenario.

The Waves 360° Surround Toolkit follows the reproduction standards recommended by the International Telecommunications Union in the ITU-R BS.775 (1993) specification. It also provides the means to handle some common compromises and variations of this standard. The **S360°**'s versatility allows it to complement other imaging tools and X/Y panners. You will find it the tool of choice for working on soundtracks or music for the best reproduction in Home Theater systems.

We believe that, with practice, surround will become as easy to work with as stereo. There is, however, a potential problem with how the consumer's actual playback system is configured and calibrated. Even if the playback system is fully calibrated and conformed to ITU recommendations, this is not the ideal array for playing a spatial 360° spherical sound field, but it is the common one in consumer electronics.

The general tip here would be not to rely on precision side Phantoms for stationary sounds. Discrete side rotation is bound to be heard as a general sideways event. It is, however, possible to reach beautiful, spatial, and atmospheric-sounding results if you follow a few basic rules.

## OVERVIEW FOR S360° PANNER AND IMAGER

### **S360° Panner:**

The Panner is quite DSP efficient, and it is intended for multi-instance use. All source channels can be mixed into the surround image using this Panner rather than the default X/Y Panner.

You can set the Rotation angle for the Center of the source image. Directly under the *Rotation* control you can select a *Rotation Pan Pot*. The two Pan Pots

available in S360° are Pair-wise or Triple-wise. They use speaker pairs or triplets to calculate the required energy distribution for the indicated rotation.

You can set the *Width Ratio* to change the width of the image using one of the available *Width Pan Pots* located directly under the Width ratio box. The divergence will always be related to the rotation, so that, when widening an image, it will always spread sideways from its center or collapse toward a mono image.

Since the 6<sup>th</sup>, or the .1 channel, is not part of the 3/2 directional speaker array, you can send a sum of the input audio to the LFE channel.

The use of the Center speaker can be specified in %. From full hard center usage to a complete phantom center created from the L & R speakers. Any value in between can be used as a balance, defining how much Center should be used to create the current *Rotation/Width* settings.

The panning graph displays a splined-circle *energy scope*, which indicates the same information that the meters display.

### ***S360° Imager:***

The S360° Imager has the same Control and feature set as the Panner, plus Distance Panning and Shuffling.

*Distance Panning* generates *Room Model Early Reflections*, balancing the direct sound and reflections creates the “Distance” and the specified room size affects the sound of the reflections. *Shuffling* is used on low frequencies for control of low frequency width.

The S360° Imager uses more DSP than the Panner. You can maximize your DSP resources by starting with a Panner and, if you find the need, hot swapping with an Imager. Your Panner settings are imported into the Imager and you can further add distance and shuffling.

The Imager’s room Early Reflections are designed to work well with the rich, decorrelated Reverb tail of the Waves R360° surround Reverb, for a complete Room emulation. The virtual environment can work with an R360° on a multichannel auxiliary to which you send or bus all your imagers. Each imager will provide the Early reflections of the source calculating the reflections according to the rotation of the panned source. This enhances the possible localization compared to generating reflections for a multichannel source.

## **S360 PLUG-INS COMPONENTS**

The Panner and Imager can be inserted on several sources with several destinations as follows:

Panner and Imager

- Mono to 5 channel
- Mono to 5.1 channel
- Stereo to 5 channel
- Stereo to 5.1 channel

Imager only

- 5 channel to 5 channel
- 5.1 channel to 5.1 channel

Most of the controls are the identical, but sometimes the selection of width Pan-pots is restricted to what is relevant to the source. Mono sources will have a mono divergence width pan-pot but not an m/s-width (available for stereo and surround components).

All Panner components support up to 192kHz.

Imager Mono to 5/5.1 supports up to 192kHz.

All other Imager components support up to 96kHz.

## Using S-360°

### BASIC OPERATION

To enjoy the full capabilities of the **S360°**, use the **M360°** Surround Manager as an insert on the Master Surround output channel. It is recommended to go through the studio calibration routine described in chapter 3 before you begin to pan sources using the other components.

If your studio is not set up according to ITU recommendations, adjust your speaker angles in the Manager so that the pan-pots will perform optimally in this setup. Even if you are sure that your studio is well calibrated it is still recommended to insert the manager for further reference. We recommend that you create a custom work setup for your studio and use it as your default.

Arrange the source tracks to your preference. Open an **S360° Panner** on each track's last insert. If you already know there are tracks which you will want to apply distance panning, you can immediately open an Imager. We recommended you use the Panner and Imager on the last insert for more efficient track processing with EQs and compressors. If you want to apply per-track, post - positioning filters you can usually bus them to an auxiliary input or move your panner upwards and insert the appropriate multichannel process after it.

For each track, use the panner's *Rotation* to specify the angle of the center of your phantom image. Use the *Width* control to specify the divergence created from the source image outwards or inwards for stereo and 5-channel sources. Use the *Center %* control to specify the amount of use of the center channel in the positioning of your image.

To add distance and room sound use an Imager component. Specify the distance in the *ER* section or by adjusting the distance marker in the graph. The actual and maximum distance will be subject to the room size. The *Room Size* and *Distance* are linked by default. This way the source is closest to the far wall. Then the link can be broken to allow imaging closer inside the room or to adjust for unnatural settings of a source that sounds more distant than possible in that room. To complete the room emulation, send the channel's output to a multichannel auxiliary with an **R360° Surround Reverb** and set your reverb tail preferences to satisfy.

So much for the basics. This is quite enough information to get started and make use of this toolkit. You are invited to continue reading it through or use it for reference.

## PANNER AND IMAGER USAGE

### ***Pan-Pots***

The *Rotation* control is controlled by a *Rotation* pan-pot and the *Width* control is controlled by a *width* pan-pot. The pan-pots are used to calculate the distribution of energy. The pan-pots are selected directly under the *Rotation* and *Width* controls.

### **ROTATION PAN-POTS:**

The available *Rotation* pan-pots are *Pair-wise* and *Triple-wise*. The *Pair-wise* pan-pot distributes energy between speaker pairs to create the image for the specified rotation. This method is fairly straightforward and provides reasonably stable precision phantoms.

The Panning Graph will give an accurate indication of the sound's position if the control room is well calibrated and the speaker placements conform to the ITU recommendations, or adjusted using the M360° Manager. The pair-wise pan-pot works well between two points, even if the listener is not exactly in the center of the sound stage. It also tolerates poorly set up sound systems. The phantom image will still appear between the two speakers.

The *Triple-wise* pan-pot uses 3 speakers to localize the phantom's center. Researchers have indicated that using 3 speakers can enhance the stability of the Phantom image. Indeed, this may be true, but you have to be more careful. Achieving the extra stability relies on the speaker setup being similar to the one

on which the phantom was created. The front sound stage is usually set in a way that can indeed make a more stable phantom, but for rear or side phantoms, the reproducibility of the *Pair-wise* pan-pot will usually be higher.

The nice thing here is that you can start with *Pair-wise* panning, then toggle to the *Triple-wise* pan-pot, and use the best-sounding one. There is no conflict between the two panners. You can pan one source with a *Pair-wise* and another with a *Triple-wise* in the very same sound stage.

#### **WIDTH PAN-POTS:**

The *Width* pan-pots are used to spread the sound source. There are several different Width pan-pots available, depending on the number of source channels.

A Mono source Panner has one *Width* pan-pot for *Mono Divergence*: A Stereo source Panner has four: *Mono Divergence*, *Balanced*, *Front-stage*, and *Focus*. A Multichannel source includes the four in the Stereo source panner plus a fifth: *Front/Rear-stage*.

***Mono Divergence*** – available for all components.

This control spread the energy of the mono source outwards from its indicated direction. The sound will still be mono but it will be less localized at its indicated rotation and in the extreme width. It will be almost equally loud in all speakers but the rotation will still preserve direction, albeit much less coherently. Mono Divergence is available for stereo sources and multichannel sources. It behaves in a similar same way, except that it increases correlation of the sound between speakers.

***Balanced*** – Available for Stereo and Multichannel components.

The balanced width pan-pot spreads the given image for a wider front while narrowing the rear. It's very useful to get a Stereo source spread nicely over the surround stage; it will widen the stereo stage, effectively shifting the side phantoms further to the sides and backwards. On a Multichannel source, it will collapse the original rear stage and widen the front stage.

***Front-stage*** – Available for Stereo and Multichannel components.

It widens the front stage by multiplying the directional image width by the specified ratio. For example, a track that has a phantom image at 20° should locate that phantom image at 40° when the *width ratio* is 2 or at 80° when the width ratio is 4.

***Front/Rear-stage*** – Available for Multichannel components.

This pan-pot widens the front and the rear stages just like the *Front-stage* pan-pot widens the front stage.

***Focus*** – Available in Stereo and Multichannel components.

This pan-pot takes each speaker pair and extracts the M and the S signal. A value of 0 width focuses only the M signal and a width value of 4, only the S signal. This has the slight effect of ambience extraction having a value of 4 as all ambience and 0 as all direct.

## ABOUT SHUFFLING

*Shuffling* is a multichannel enhancement process which has few unwanted side effects, but which can add a sense of spaciousness and life to an otherwise ordinary spatial image.

*Shuffling* is particularly suited to recordings made using standard panning techniques made on most mixing consoles or their digital equivalents. The stereo effect from two loudspeakers creates the illusion, in the ears and mind of the listener, of illusory phantom images lying between the loudspeakers. This illusion, however, is not perfect, and one known fault is that for sounds panned to intermediate positions, the apparent stereo stage width is narrower at bass frequencies than in the mid and high treble. The reason for this is that the ears and brain determine sound direction by different methods below and above around 700 Hz.

*Shuffling* is a process that widens the bass frequencies so as to make the phantom bass and treble images seem to be of comparable soundstage width. This generally occurs when the *shuffling level* is set at around 1.6 with shuffle *frequency* around 650 Hz. This setting is recommended for sharpest imaging. If you increase the bass width even further, so that the bass is over-wide compared to the treble, it will create less precise stereo images, but generally tends to create an illusion of “spaciousness” and sounds from beyond the loudspeakers. This helps make up for the fact that the stereo image is normally confined to the space between the loudspeakers, rather than being all around as in real life. This effect is generally best when the *Shuffling level* is between 2.0 and 2.5, and *Shuffle frequency* is around 650 Hz. This setting is recommended for best spaciousness on most material. Such settings are especially useful on material that otherwise sounds too narrow. In surround systems with a Subwoofer, *Shuffling* may come to save the day. The Subwoofer may be set to playback all Low frequency content under 80Hz – 100Hz and this can further narrow the spatial image of the Low frequency content. *Shuffling* can help to regain the low frequency width as well as to intensify spaciousness and envelopment of the atmospheric elements in the mix.

*Shuffling* has no effect on the imaging of central or mono images, but only on sounds panned away from the center. Its effect is not to enhance mono images, but rather to enhance the stereo effect already present in stereo images. Unlike previous commercially available stereo shufflers, it is fully phase compensated, i.e. does not introduce unwanted phase errors between the stereo



channels. This gives improved stereo sound quality with low listening fatigue. It is also carefully designed to minimize tonal alterations of the mix in the bass. The application of shuffling has no significant effect on mono compatibility.

It comprises two controls: “*shuffling*” and “*frequency*”.

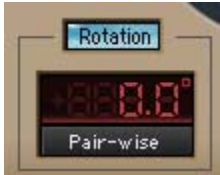
“*Shuffling*” controls the magnitude of bass width increase between 1 (no shuffling) and 3 (maximum bass width increase). The subjectively best value usually lies between 1.6 and 2.5.

“*Frequency*” controls the frequency below which the shuffling width is increased. This *frequency* may be adjusted between 350 and 1400 Hz. For normal stereo monitoring, a *frequency* between 600 and 700 Hz usually sounds best. A higher *frequency* may be better if the sound is intended to be used with the very close loudspeakers often used in multimedia, portable or TV one-piece reproducer systems where the stereo speakers are in the same box. A lower frequency is useful when adjusting stereo originating in stereo microphone techniques where the microphones are spaced apart by perhaps 20 or 30 centimeters.

# S360° Controls and Displays

## PANNER AND IMAGER CONTROLS

### *Rotation Section*



The *Rotation* section consists of 3 controls.

**ROTATION:** On/Off. Default: On.

This control Turns the *Rotation* on or off. It lets you compare no *rotation* to any applied *rotation* at a single click.

**ROTATION ANGLE:** +180° to −180°. Default 0°.

The angle will determine the direction of the phantom image that you are panning.

**ROTATION PAN-POT:** *Pair-wise*, *Triple-wise*. Default: *Pair-wise*.

This selects the method by which the *Rotation* will be calculated.

### *Width Section*



The Width section consists of 3 controls.

**WIDTH:** On/Off. Default: On.

This control Turns the width settings on or off. It is useful to audition the sound with or without the applied width.

**WIDTH RATIO:** 0 to 4. Default 1.

0 will collapse any image to a mono phantom. 1 will usually represent Bypass although some *width* Pan-pots don't have a true input-accurate bypass. A ratio of 4 will be the widest. The sound of the *width* settings vary according to the selected *Width* Pan-Pot.

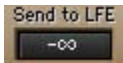
**WIDTH PAN-POT:** *Mono Divergence*, *Balanced*, *Front-stage*, *Focus*, *Front/Rear stage*. Default: *Mono* for mono input, *Balanced* for other.

**CENTER %:** 0 (Phantom) to 100% (discrete). Default:100%.



Specifies the use of the center speaker as a discrete sound source or to create a phantom center by taking the sound in the center and feeding it equally to the Left and Right speakers -3dB. Note that this is not muting the *Center*, which will distort the calculations of the pan-pot.

**SEND TO LFE:** –Infinity to 0dB. Default: –Infinity.



This control redirects the track's audio to the LFE channel by the gain specified.

## IMAGER ONLY CONTROLS

### *Early Reflections section.*

**ER:** On/Off. Default: Off.



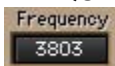
This control turns the *Early Reflections* on or off. It is useful to audition your track with distance panning vs. normal panning.

**ER ABSORB:** 0.0 to –18.0dB. Default: –8.0dB



This control is a high Shelf on the *Early Reflections* path. In conjunction with the shelf's cutoff *Frequency*, it allows you to set how bright or dull the *ER*'s will sound.

**FREQUENCY:** 1400Hz to 21000Hz. Default: 4498Hz.



This is the *ER Absorb* shelf cutoff *Frequency*.

**DISTANCE:** 1 to 20 meters. Default: 1 meter.



This control sets the virtual *Distance* of the audio in the track. This uses sophisticated gain laws between the direct and *ER*'s and works best when the *Distance* is linked to the *Room size*.

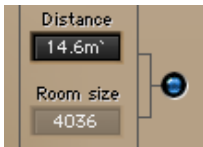
**ROOM SIZE:** 1200 to 6500 Square Meters. Default: 1200.



This control sets the general size of the virtual room by manipulating the relationship between the early reflections. Generally the larger the room, the farther apart the reflections will be, but there are also direction issues related to

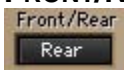
the *Rotation* applied so that the *Early Reflections* will strengthen localization and enhance the sweet spot. For best results, it should be linked to the *Distance*.

**DISTANCE/ROOMSIZE LINK:** Link/UnLink. Default: Link.



The link sets the relation between *Distance* and *Room size* so that the sound seems close to the wall. This creates the most convincing distance panning in our experience. While linked, the *Distance* will be controlled by *Room size* and it will be disabled for user manipulation.

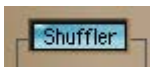
**FRONT/REAR:** 0%=*Rear* – 100%=*Front*. Default: 50%.



This sets the *Early Reflections* to be dominant in the front stage or the rear stage. It creates the sensation of being somewhere in the room, but not necessarily in the middle.

## ***Shuffler Section***

**SHUFFLER:** On/Off. Default: Off.



This control turns the *shuffling*, or *low frequency width*, on or off. It's useful for comparing *shuffling* effect vs. no *shuffling*.

**SHUFFLE LEVEL:** 0.00 to 3.00. Default 1.00.



Controls the amount of *Shuffling* that will occur for *Frequencies* below the value indicated in the *Frequency* control of the *Shuffler*.

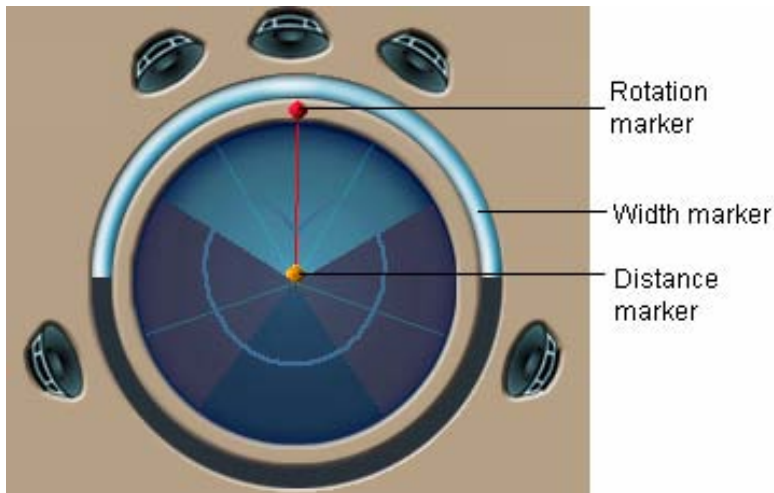
**FREQUENCY:** 20 to 5000Hz. Default 702Hz.



Sets the *Frequency* below which *Shuffling* will occur.

## PANNER AND IMAGER DISPLAYS

### ROTATION GRAPH

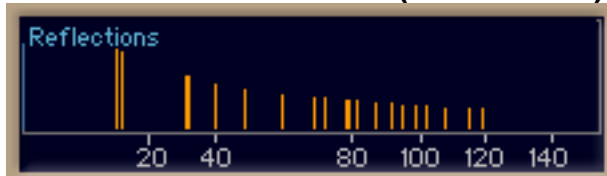


The Rotation Graph has markers for controlling the *Rotation*, *Width* and *Distance*. It also shows a directional energy meter which displays the same information as the output peak meters. Clicking on the *Speaker* icons makes the *rotation* jump to the angle of the clicked speaker.

The graph shows beams in the angles where the speakers are. If you calibrate and send *speaker angles* in the **M360°** manager, the angles will update and be reflected by the beams in the graph. The speaker icons will remain at the normal placement, allowing you to see the gap between the calibrated speaker angles and the default normal placements.

The graph will display the width in conjunction with the selected width *Pan-pot*. The *outer circle* will represent the *absolute width ratio* and will not rotate with the inside of the *rotation graph*.

### EARLY REFLECTIONS GRAPH (IMAGER ONLY)



This graph shows the *Impulse response* or timing and level of the *Early Reflections* generated by the *distance panning*.