



PS22
Pseudostereo

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Acknowledgment

Michael Gerzon, the inventor of the PS22 process, died in May 1996, only a few months before releasing this product. Michael invested years of mathematical research, as well as audio engineering into this new type of process. Although the basic process underlying PS22 was previously incorporated into some commercial products, PS22 is the first time this process has been made available as a precision tool for pro audio engineers.

Michael did live to see the last stages of development of PS22, and was very pleased with what he saw and heard.

This Users Guide was drafted by Michael, and is a vivid example to the devotion this man had into creating excellent audio processing tools, and educating for their correct use and understanding. This is especially evident reading the text in **Section 2: In-depth topics**, which is almost untouched from Michael's original draft.

Process licensed from Trifield Productions Limited, US Patent 5671287

Introduction



PS22 StereoMaker is a set of tools for creating convincing stereo results from mono source material as well as a set of true stereo-in/stereo-out processing tools for synthesizing a richer stereo effect from existing stereo material.

It is far more than merely another “pseudostereo” effect. It is a mixdown and remastering tool capable of producing subtle or dramatic stereo effects of a kind and quality previously impossible - something that will become an essential tool in everyday stereo production of all kinds.

The idea of synthesizing a fake stereo effect from mono sources is a very old one, but the results have usually been disappointing and very often virtually unlistenable, giving unpleasant and unconvincing results. StereoMaker’s tools are unique, and have been designed after decades of research to avoid the problems of previous processes.

Several aspects distinguish StereoMaker tools from previous pseudostereo effects:

- (i) **tonal neutrality.** All StereoMaker processing preserves the original frequency response. Any tonal alteration should be the result of intentional equalization desired by a user, not an accidental byproduct of stereo processing. StereoMaker is designed to leave the tonal quality of the original source unaltered.
- (ii) **Very low phasiness.** The unique patented StereoMaker processing produces sounds of low phasiness, giving a highly listenable sound. Ordinary stereo pans sounds to different positions with low interchannel phase difference. Previous pseudostereo processing caused large interchannel phase differences which produced a vague and phasey sound which was not pleasant to listen to for extended periods.
- (iii) **Stereo-in/stereo-out processing.** While StereoMaker processing can be applied to central mono sounds to produce a stereo spread effect, StereoMaker is unique in actually working with full stereo inputs, spreading each input stereo sound source around its position in the original stereo stage. This means StereoMaker can be used to enhance the spread of each sound image within a stereo mix, or with panned mono sound. StereoMaker thickens the stereo width of any stereo sound source around its original position. This gives much more flexibility in composing rich stereo mixes than processes that only give a blanket spread to central mono sounds.
- (iv) **Wide spread effect.** While StereoMaker is fully adjustable to achieve subtle narrow degrees of spread if desired, it is unique in the extreme of wideness of effect it can achieve. StereoMaker allows very extreme left-right stereo to be achieved which nevertheless sounds convincing and real. Conventional pseudostereo is often sufficiently subtle that stereo effects are quite difficult to hear other than when doing straight A/B comparisons with the original mono.

- (v) **intuitive user controls and interface.** All synthesis of stereo from mono inevitably involves an artistic judgment as to where sounds should appear from in the stereo stage, since there is no position information in the original mono. StereoMaker provides a range of user controls that allows the stereo effect to be composed in an intuitive manner, offering not just control of the degree of spread and spaciousness, but also positioning of dominant sounds within the stage. A graphical display shows stereo positioning as a function of frequency.
- (vi) **No unwanted processing side effects.** StereoMaker aims at avoiding any sound alterations other than those needed to create a convincing stereoism. As such, it has no conflict with other kinds of processing such as EQ or reverb. In particular, StereoMaker is not a reverb or echo effect, so that the original artistic decisions in the monosound are not being modified. StereoMaker may be used with EQ tools such as Waves Q10 or with room simulation tools such as Waves TrueVerb for more creative effects - the user's choice of the nature of each effect is preserved.

PS22 StereoMaker is a toolkit of three separate processes, packaged as two plug-ins, which may be used separately or in various combinations. The three processes are all stereo-in/stereo out, and are each optimized to achieve different kinds of results. Their stereo sound is very different from each other, and you will soon discover which kind of process is suited to different artistic or creative needs. None of the processes is a substitute for the others - they are all different.

The three processes are: **PS-Spread**, **PS-Split**, and **DLA**. All the PS processes share the low phasiness, and stereo compatibility features as described above. Each of the two master plug-ins have at least two component plug-ins, which will be described in this chapter. The **DLA** 'family' of plug-ins comes with the PS package, and is designed to be used in conjunction with the PS processes in specific ways.

PS22 StereoMaker plug-in

This master plug-in has three components: PS22-Spread, PS22-Split, and PS22-XSplit.

PS-Spread creates a smooth spreading of sounds across the stereo stage. It not only has low phasiness and the capability of spreading around any stereo position, but it also offers adjustment of additional bass spread enhancement for an exceptionally spacious effect. There are two variations of this plug-in: PS22-Spread and PS22-Spread(10). The (10) version has only 10 sweeps, and therefore uses less DSP. All the PS plug-ins are based on the controls of the PS-Spread, so you should read Chapter 2: PS-Spread before reading about any other component's controls.

PS-Split completely splits sounds across the stereo stage. Visually speaking, the graphic representation of the PS-Split looks like a square wave swinging between left and right, where the PS-Spread effect looks like a sine wave. The resulting effect is a dramatic left-right split. Best results are normally achieved when PS-Split is followed with one of the DLA-X process (or a reverb effect), but it can be used without them.

PS-XSplit is almost the same as PS-Split followed by DLA-XL built into a single interface. The DLA-X and PS-Split processes complement each other to create a more natural, yet more spectacular stereo effect, as explained below. By having the two processes combined into one user interface and linking some controls, it is much easier for you to achieve optimal results.

In the DLA plug-in are 6 components, two of which are not part of the PS process, but are small plug-ins to compensate for the delay in the C1 and L1 plug-ins. See the **DLA chapter** for more detail on these components.

The **DLA-X** process family is based on short time stereo cross feed delays (not an echo effect). DLA-X is the basic effect; DLA-XL controls the amount of cross feed separately for the high and low frequencies, and DLA-XLB has an optional longer delay of low frequencies. While DLA-X processors can be useful used on mono input sources, it is most effective on stereo inputs, and especially when used in cascade with either PS-Spread or PS-Split can give spectacular and dramatic results.

The DLA-X and PS processes complement each other. When used on mono input sources DLA-X tends to produce a comb-filter coloration side effect as a result of the interaction between the delayed and original sound. On the other hand, PS-Split (and for a lesser extent PS-Spread) will split the spectrum of a central sound so that distinct frequency bands will exist only in one of the two stereo channels, this has a different kind of coloration side effect.

When DLA-X and PS plug-ins are used together, the DLA-X cross-feeds the missing frequency bands from one channel to the other, but since each channel has different frequency bands, the interaction between the delayed and original signal is avoided. A similar, but more complex effect takes place on stereo input.

Note that following PS-Split by a stereo compatible reverb will achieve similar results, so using DLA-X is not needed in this case.

PS-Split is the tool to use when you wish to split input mono sounds into two almost completely separate stereo positions, e.g. for a dramatic left-right split. It is capable of extreme and dramatic stereo separation effects. Best results are normally achieved when used in conjunction with one of the DLA-X plug-ins, but it can also be used either on its own or with a reverb effects unit.

All three effects are fully user-adjustable from zero effect up to a high degree of effect — as much or as little reprocessing of stereo effect as you want or need. The quality as well as amount of the stereo effect is also fully under user control.

The PS22-Spread component has the basic set of controls common to all 3 PS components. In the PS-Split component chapter, only the additional controls will be discussed. Therefore, we'll describe each control of the PS22-Spread in detail.

Chapter 1 - Essential overview

Controls

These fall into two groups: Input and Spread.

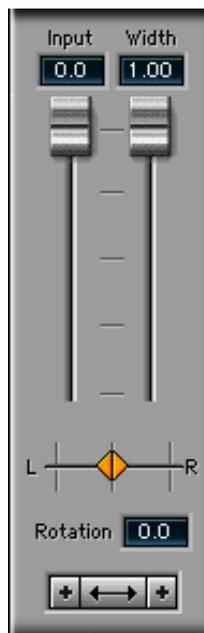
Input Controls

Gain From 0.0 to -24.0dB. Adjusts input level so that potential output clipping problems can be avoided.

Width Adjusts the width of an input signal all the way from mono (width 0.00) to original stereo (width 1.00). Used to adjust the degree of stereo retained from the input signal before the PS22 spreading effect. This lets you collapse the input signal to avoid making a signal too wide with the PS process.

Rotation In degrees from -45.0 to +45.0. Exactly like the S1's Rotation control, adjusting the centering of the input stereo signal without affecting level-balance. Useful for centering off-center input material or for panning mono material to the left or right.

Channel polarity and channel swap buttons. These are intended to correct errors in the input stereo signal. The +/- buttons adjust the polarities of the individual channels. Normally, both should be set to "+", but if the input stereo is out of phase, the button on one channel should be set to "+" and the other to "-". You should not normally set both buttons to "-" unless you understand why you are doing this. The <-> (channel swap) button swaps left and right channels at the input if the stereo channels have accidentally been reversed or where it is desired to reverse the input stereo effect.



Spread controls

These controls affect the way sound images are spread and will be described in terms of what they do to a central mono input sound. The effect for other stereo input sounds will be described in more detail later in the manual.

They are divided into two groups. The top line of controls under the graphical display are Spread envelope controls, and the bottom line of controls are Spread statistics controls.



Spread envelope controls

These control the total degree of spreading as a function of frequency.

- Spread** Adjusts the degree of spreading from 0 (no spreading) to 1.2 (ultra wide spread). A spread of 1 fills the sound stage between the two stereo loudspeakers. By using Spread together with the input Width control, and the MS metering (see details below) you can adjust the overall stereo content of your output signal so it is not exaggerated.
- Freq** In Hertz (Hz). This adjusts the frequency at which bass spread starts acting. A good starting value is 630 Hz, although the range covers from 32 Hz to 16kHz.
- LFspread** This provides additional adjustment of spread at bass frequencies. The degree of spread is the same as at high frequencies if LFspread is 1.0, the bass is wider and more spacious if larger values of LFspread such as 2.0 are used, and the bass becomes more mono and centered in the stereo stage if a smaller degree of LFspread approaching 0.0 is used.

Spread statistics controls

These four controls adjust the precise way the input sound is panned to and fro between left and right as a function of frequency. The panning is shown on the display graphic.



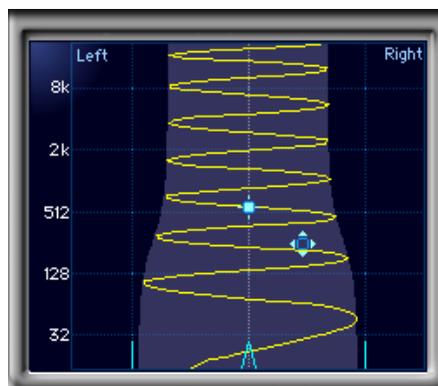
- Sweeps** This control is the number of sweeps between left and right across the entire audio frequency range. In other words, how many bands the audio is divided into. The value ranges from 2 to 22 [or 2 to 10 in the PS-Spread(10)], . For 2 it sweeps from left to right and then back to left again as one goes from low to high frequencies, up to 22 sweeps. (Note that at some control settings, some of the sweeps to-and fro may be outside the graphic display frequency range).

- FCenter** In Hz. This control adjusts the center frequency around which the density of sweeps to-and fro can be increased or decreased by the FDensity control. This allows the maximum degree of to-and-fro processing to be concentrated mostly in a given frequency range if desired.
- FDensity** This controls weather to increase or decrease the density of sweeps around the FCenter frequency. When set to 0, the to-and-fro sweeps are fairly uniformly distributed across the audio frequency range. For positive values of FDensity, the to-and-fro sweeps are more dense near the FCenter frequency and less dense far away from it. For negative values of FDensity, the to-and-fro sweeps are spaced wider apart near FCenter frequency, and more dense at the bass and treble ends of the audio range.
- Tweak** For a given setting of the other controls, this control allows the user to tweak how particular frequencies are panned within the spread stereo stage. When varied between -1 and +1, each individual frequency will be panned trough all the possible positions between left and right. It is usually the most useful control when trying to achieve a balanced spread sound stage between left and right loudspeakers.

Important note for when Sweeps = 2. FCenter and FDensity controls do not work for 2 Sweeps, and Tweak then only has the effect of reversing the left and right aspects of spreading when set outside the range -0.5 to + 0.5. The main controls for altering spreading effect with 2 Sweeps are provided by the three spread envelope controls Freq, Spread and LFSpread. The effect of FCenter, FDensity and Tweak becomes more evident when Sweeps is 3 or higher.

Graphic display

The graphic display of PS-Spread displays the way stereo position of a central mono input source is varied at the output as a function of frequency. Also shown in light blue is the overall spread envelope, i.e. the degree of spreading as a function of frequency. The vertical grid lines show left, center and right stereo positions. If the stereo position is shown beyond the left or right lines, this corresponds to signals having an antiphase relationship between the two stereo channels.



The graph also has two cursors. The solid-square **Density cursor** (shown upper left in graphic) controls FCenter frequency vertically and FDensity horizontally. Pressing the **option key** while dragging vertically changes the **Tweak** instead of the FCenter value. -

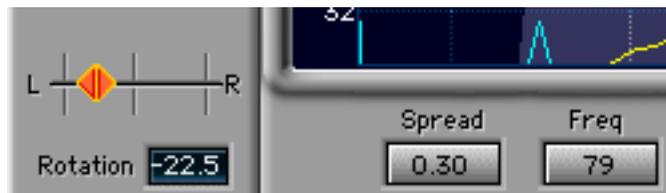
The open-square **Spread cursor** (shown lower right in graphic, with four arrows) controls the Spread horizontally and the transition Frequency of the spread envelope vertically. Pressing the **option key** while dragging horizontally changes the **LFspread** instead of the Spread value.

Either of these grab markers may be selected and dragged by clicking on them with a mouse and dragging them to new values.

When you drag the **Spread cursor**, the graph is redrawn in real time to indicate the relative spread of high and low frequencies, and the transition frequency.

The graphic display also shows the **Rotation** and **Width** of the input control settings as light blue lines for the left and right, and a light blue **pointer** (an upside-down “V”) in the middle, showing the center of the signal (see graphic below). These three markers are the **Input Stereo cursors**.

You can drag these Rotation and Width lines directly in the graph, or on the faders on the left of the graph. In both the graph and the faders, horizontal mousing controls the Rotation, vertical mousing controls Width.



It is important to have these lines displayed so that you can see when you might be getting “too wide” with the output. The light gray vertical lines that go from top to bottom on the graph show the normal Left and Right pan positions. Anything outside these lines is anti-phase, which, although it might sound great, may have mono-compatibility problems, or might be fatiguing for long listening periods. Therefore, by putting the Rotation and Width display on the same graph, you can see if excessive width might be caused by the PS process.

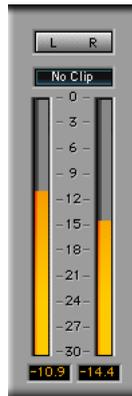
If you have a very wide stereo input, it is advisable to reduce the Width somewhat before applying the Spread. By using the graph and the MS meters, you have a lot of information that can help create a highly-listenable and creative sound. The MS meters are discussed in the next section.

Metering

On the right side of the PS22 window are the bar level meters. The meters always indicate the current output of PS22. Above the meters is a clip light. If a clip occurs, the Clip Box above the dB meters will indicate “clip” until the meters are reset.

The clip indicator light is always active, including during non real time (NRT) file based Processing. This is a great advantage in determining whether a clip occurred during the NRT Process of a file.

Below the level meters are digital values showing the highest peak encountered. To reset these peak level values and the clip indicator, just click anywhere inside the level meters.



Although the PS22 processing is designed not to change the energy levels of incoming sounds, it does alter both the phase and the stereo positioning of different sound components in the input signal. This can cause the output peak levels to be higher than in the input stereo signal. In some very extreme cases, peak levels can be increased by 9 dB or more - although this is very rare, and figures of 2 or 3 dB are more common. If the output meters indicate clipping as a result, you are advised to reduce input gain to avoid clipping.

LR and MS display modes

The PS22 meters have two modes of display: LR, and MS. The LR mode is the standard Left and Right level meters. Using the MS mode is explained below. The MS mode only affects what the meters display, and has no effect on the output. The mode may be selected by clicking on the L-and-R/M-and-S button above the meters.

Uses of MS meter mode

MS metering mode displays the levels of two signals, **M** representing the amount of mono present, and **S** representing the side signal, i.e. the signal representing the differences between the two stereo channels. The greater the degree of stereoism present, the higher the S signal when compared to the M signal.

Judging effect of spreading

On mono inputs, MS metering can be useful in indicating the degree of stereoism produced by a given degree of spread processing. Generally speaking, the widest spatial effect will be obtained when M and S levels are roughly equal, with a narrower effect if S level is smaller than the M level. If the S level is typically larger than the M level, this may indicate an excessive degree of spread processing that could sound fatiguing on extended listening or could lead to mono compatibility problems.

Diagnosing stereo input problems

In general, spread processing will only be successful if applied to input stereo signals that are in phase and not excessively wide. The MS metering on PS22 can be used to help diagnose problems with the input stereo signal.

Without processing, i.e. with zero spread, and width at 1 and rotation at 0, the MS meter mode can be used to judge whether the input stereo material is in phase. If it is, the M level will generally be significantly higher than the S.

If, without processing, the S level is generally higher than the M level, this indicates one of two possibilities:

- (1) the most likely, that the input channels are out of phase, for example due to an analog-domain wiring error in balanced cables somewhere in the stereo signal chain, an incorrect setting of a phase switch, or possibly an incorrectly wired microphone capsule in a stereo pair of microphones. Correct this by altering one only of the two input polarity buttons to read “ - “ rather than “ + “. Monitor the output to verify that changing the polarity does indeed improve the sharpness of stereo images, particularly for sounds at the center of the stereo stage.
- (2) in unusual cases (such as certain specialist one-point stereo microphone recording techniques such as MS or “Blumlein figure-of-eight” when presented with a very wide sound source stage, or if previous excessive width or spread adjustment has been used) it is possible that the S meter can read higher than the M without a channel polarity error due to excessive width. In this case, center stage sounds WILL be in phase, and the phase switches should NOT be used.

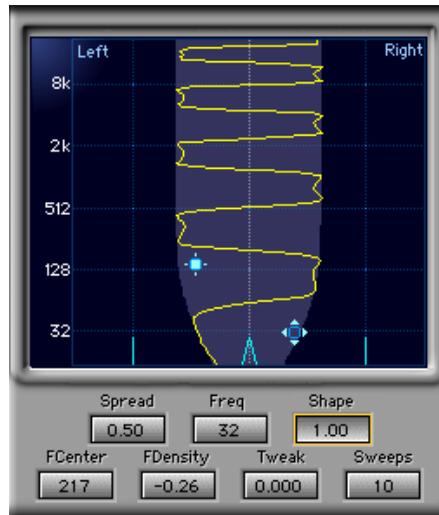
If the input stereo is in-phase but very wide according to the levels indicated on the S meter, then the effect of PS processing may sound excessive, and you may find it useful to use the width control to narrow the stereo input image first.

Chapter 2 - PS-Split

The **PS22 PS-Split** and **XSplit** components are designed primarily to take a mono input and to spread different frequencies to and fro around the central position. Each frequency is panned to a different position within the stereo stage, as shown on-screen.

PS-Split differs from PS-Spread mainly in that the PS-Spread has “sine-wave” panning, and the Split has “square wave” panning, where most frequencies are either panned sharply to the left or right position, with very few frequencies in-between. It is called PS-Split because it in effect splits the frequency components of a mono sound between just two positions in the stereo stage. PS-Split is preferred in cases where a very dramatic stereo effect is wanted.

Split and XSplit both have a **Shape** control that alters the “waveform” of the splitting of the signal. For instance, it can vary from a smooth panning similar to the Spread, or to a “square wave”, with almost all sounds being panned completely apart with very fast transitions between these bands.



PS-Split and XSplit have identical controls to PS-Spread, except for these changes:

- 1 — There is no **LFspread** control (the low frequency spread is always set to 0).
- 2 — **Freq** now adjusts that frequency below which spread is pulled towards 0. The range of the frequency control is still 32 Hz to 16kHz.
- 3 — The **Sweeps** range is from 2 to 10.
- 4 — The **Shape** control.

Shape control ranges from 0.00 to 1.25.

When Shape=0.00, it is more of a triangle waveform.

Shape=0.15, the shape is the same as the sine-wave shape of the Spread.

Shape=1.00, the shape is square-wave.

Shape=1.25, the shape is a HyperSquare that has some ‘overshoots’.

The Shape control make the PS-Split similar to a variable PS22-Spread(10), so for sound design applications where you might want a larger degree of stereoism, the Split version gives you more flexibility, although the number of Sweeps is limited due to DSP requirements.

Adjusting the Shape control is almost completely by subjective choice, and should be used “to taste”.

Split and **XSplit** are generally used for taking a mono input and creating a strongly separated stereo image from it, but can be used with stereo inputs as well. The Spread (or Split with lower values of Shape) are generally recommended for stereo inputs, but there are no rules, just suggestions!

PS-XSplit plug-in

The XSplit also has a DLA-XL “built-in”, and doesn’t require the external plug-in, unless you need the XLB, which you can simply use inserted after the Split component.

The DLA-XL is fully integrated into the logic of XSplit and takes in account the internal settings of the XSplit parameters when computing it’s own settings. Two additional controls are given to the user: **Delay** and **Xfeed**.

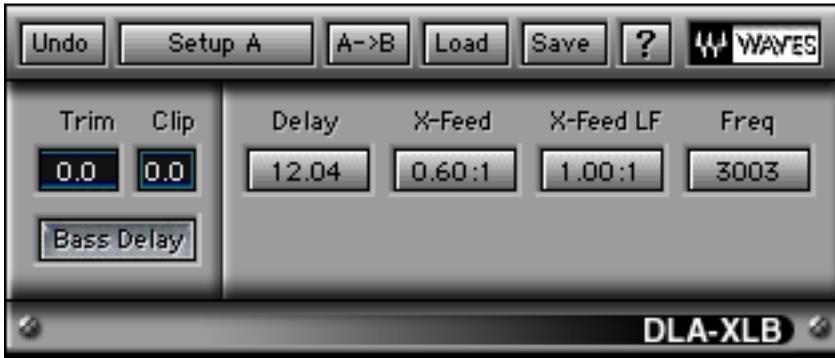
Delay is exactly the cross feed delay as in DLA-XL.

Xfeed is different from the DLA-XL control in that it takes in account the current setting of **Spread**. When Xfeed = 1.0 the amount of cross feed fully compensates for the current degree of **Spread**, Xfeed<1.0 means the Spread is partly compensated. Normally the recommended setting is Xfeed=0.5.

The settings of the low frequency transition and Xfeed are set internally according to the Spread transition frequency.

Here is why the Xfeed and LF settings have an “auto” compensation, and it’s important. The best Xfeed gain should be equal to or less than the Spread value (when Shape is 1.0, a “square wave”). Therefore, you can set XFeed to a value, then when varying Spread, XSplit will automatically “track” the crossfeed gain for you. XFeed also compensates for varying shapes.

For setting the Xfeed gain when using separate plug-ins (like Spread and DLA-X) see the next chapter, Using PS22 with DLA.



The DLA-XLB plug-in window

This plug-in provides 6 different components:

- DLA** a simple, single-sample increment delay plug-in, mono/stereo, with display in milliseconds (ms) and samples; adjustable from 1 to 1024 samples (approximately 0.02 to 23ms @44.1kHz). This is for simple effects, azimuth adjustment, etc.
- C1delay** to compensate for the C1 delay, which is 340 samples.
- L1delay** L1 compensation, 64 samples

and the more sophisticated delays, for use with the PS plug-ins:

- DLA-X** crossfeed of one channel to the other, with a delay; this is wideband crossfeed; stereo-only.
- DLA-XL** the DLA-X, plus a Low Frequency crossfeed control and crossover point.
- DLA-XLB** the DLA-XL, plus an extra Bass delay (an on/off toggle).

Each of the DLA-X plug-ins, has more features, and uses more DSP. If you don't need a feature you can use the simpler plug-in and save DSP power.

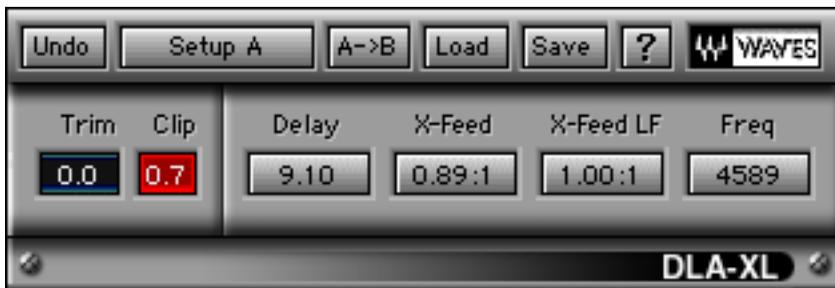
About the DLA-X ‘family’

The DLA-X tools are in general stereo-in/stereo-out processors that (1) increase the stereo effect, (2) maintain the overall stereo frequency response. They are based on adding short time-delayed stereo signals to the original stereo that are too short to be heard as discrete echoes. Their main effect is to add an enhanced “bigger” or more spacious quality to the input mono or stereo signal. DLA-X is designed specifically as an enhancement to the PS-Spread or PS-Split StereoMaker processes. Inserting the DLA-X process after a PS processor can result in a highly convincing synthetic stereo effect on mono input sources.

This can be easily heard by listening to just one channel of a PS output, which of course will be missing frequencies that are on the other channel; this could be fatiguing over a long period of time. By using the DLA-X processes, each channel is delayed between 5 and 20 milliseconds and added back to the opposite channel. In this way, each channel still has the original frequency response, does not have the ‘comb-filter’ sound, and in fact the stereo image spread is increased!

DLA controls

- Delay** In milliseconds from 0.5 to 20ms (and shown in samples on the DLA plug-in). This controls the timing of the added delay. Generally values between 5.0 and 20 ms are recommended. Popular music and speech will benefit from delays between 6 and 12 ms, and classical music from delays between 12 and 20 ms.
- XFeed** The ratio of direct to delayed sound. (1.0 is unity gain, 0.5 is -6dB, 0.0 is off). Generally a value of 0.5 is around optimal, with values between 0.3 and 0.65 generally recommended, but any values up to 1.0 may be used. Settings near 1.0 can give a spectacular (but maybe colored and oppressive) effect, and when less than 0.25 can give a subtle and not always obvious effect.



The DLA-XL plug-in window

XFeed LF: (DLA-XL, and XLB only) Separate control for the ratio of direct to delayed sound on low frequencies. **Xfeed LF** is used as a multiplier of **Xfeed**, so that If you have Xfeed=1.0 and Low Xfeed at 0.0, and the Freq at 500, nothing below 500Hz would be cross-fed to the other channel. Everything above 500 would be delayed and cross-fed. This lets you selectively reduce the amount of low frequencies that are cross-fed, which can be very helpful, depending on the source material. More application details are in the chapter Using PS22 with DLA.

Freq: (DLA-XL, and XLB only) In Hz. The transition frequency below which Xfeed LF is effective.

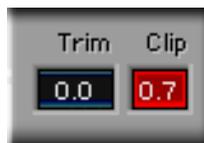
Bass Delay: (DLA-XLB only) When 'On', the frequencies below 160Hz are delayed an additional 9ms to offer a possibly improved subjective bass response, which is highly dependent on the source material. Some sources will sound better with the delay, some not.



Trim/Clip On the DLA-X, XL, and XLB, (but not on the simple DLA plug-in), at the right edge of the screen are two displays in dB. Due to the nature of a crossfeeding delay, peak levels can be increased by as much as 3dB, and even more if filtering is also involved. If this happens, the **Clip** display will turn red and show the value in dB by how much the gain must be reduced to avoid a clip, as seen in the top graphic.

To adjust gain, just click on the **Trim** display and it will automatically insert the value shown in the Clip display. You can also drag up and down on the Trim display to manually set the gain, with a range of 0.0 to -6.0dB.

The clip indicator is always active, including during file-based Processing (whether destructive or constructive). This is a great advantage in determining whether a clip occurred during a file-based Process.



Chapter 3 - Using PS22 with DLA

The impact of the effect when PS22 is followed by a DLA processor can not be obtained by any single process on its own. You will get the maximum benefit and most spectacular stereo from the PS22 StereoMaker system by using more than one process together (or the combined PS22 XSplit). This chapter advises on how this can be done for most dramatic effect. This does not necessarily apply for very subtle uses of the PS plug-ins, say when Spread is about 0.35 or less. DLA-X series plug-ins are not needed then.

The various rules given are for guidance about how to avoid unwanted side effects such as coloration or loss of psychoacoustic effects. However, feel free to break the rules if your ears really like the resulting effect!

Typically the PS plug-in (Split or Spread) should precede the DLA-X plug-in. (Remember, PS-XSplit has a built-in DLA-X, there is no need for another one.)

You can put them in any order, however, if you are going to adjust the Width of a stereo input in the PS component, it is best to always put the DLA plug-in after it in order to avoid any comb-filter coloration in non-central sounds.

Especially with wider PS-Spread or PS-Split settings, the effect of adding DLA with XFeed set to 0.5 can be spectacular, filling out the stereo stage and making it much more convincing. This works extremely well even for a low number of Sweeps in Spread or Split, even when Sweep=2, spreading gives very remarkable results.

Although the standard PS-Spread and PS-Split modules use up most of the DSP power of some DSP cards, the Spread can be used with the basic DLA-X on most DSP cards, at least at the 44.1 kHz sampling rate.

If, and only when, Width=1 on PS-Spread or PS-Split modules, the effect of putting a DLA-X plug-in before or after the PS will be the same, so that the order of the components is not important.

Recommended DLA settings

For these examples, we assume you have inserted a DLA-X, XL, or XLB after a PS-Spread or Split plug-in.

- Xfeed** 0.3 to 1.0, with 0.5 being a good starting point
- Delay** Varies with program material.
5 ms, for speech
6 to 12 ms, for pop music and jazz
5 to 20 ms, for classical orchestral, organ and choral music.
Of course, for sound design, anything goes.
- LF Xfeed** Highly subjective, but there is research strongly indicating that crossfeeding frequencies below 5kHz at a lower gain than the frequencies above will be more listenable for a longer period of time. Therefore, LF Xfeed can be set to a lower value than the overall Xfeed (remember that LF Xfeed is a multiplier, so if LF Xfeed=1.0, then the actual value is the same as Xfeed, so setting **LF Xfeed=0.6** may be a good starting point.
- Freq** Highly subjective (see previous paragraph); a good starting point is 5kHz.
- BassDelay** This will completely be dependent on the source material, and if really not needed, you'll have more efficient use of DSP if you use the DLA-XL instead.

Chapter 4 - Tutorial

For those who want to start quickly and read as little as possible, we'd like to offer this small chapter with a single example. To be honest, you're missing a lot of information if you don't read more and probably won't be able to use the PS22 system nearly as well. Plus your family will be deeply disappointed, of course.

One simple example

A common use of the PS22 system will be to make a strong stereo image from a mono source, so this example shows each step in that process.

First, you should insert a PS-Spread, followed by a DLA-X.

Second, you should be using a mono source fed to both inputs of the PS-Spread.

Third, set the DLA-X **Delay=6.0**, and the **Xfeed=0.0**. This Xfeed value sets the DLA with no effect (no crossfeed).



Next, set the PS-Spread to these values:

Sweeps=8

Spread=1.0

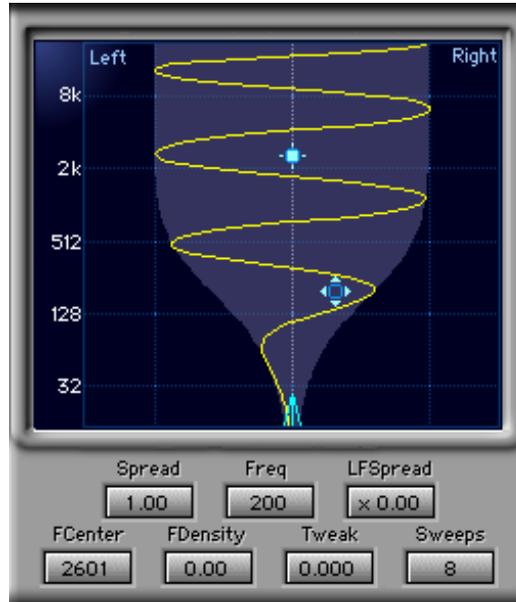
LFSpread=0.0

Freq=200

FCenter=around 2600

Tweak and FDensity should both be 0.0.

It should now look exactly like the screenshot on the next page.



This gives a wide spread to much of the sound while leaving the bass mostly in the middle. By having 8 sweeps, the sound has a combination of stereo positioning and diffusion (good for both instruments or sound effects).

Monitor the output and use the Bypass button to hear the difference. Most likely, the image will not be centered, or seem that some important frequency is coming from one side or the other.

To center the image, adjust the **Tweak** control between -0.5 and +0.5; you'll hear the frequencies move around in the stereo image.

To optimize the spread, now drag the **Density cursor** (with the small box  slowly to the left so that the **FDensity** is about 0.4. The sound will change quite a bit as you do this. Drag the cursor slowly up and down to change the **FCenter** until the image spread is good. Then adjust Tweak again to re-balance the image.

Hint: the settings of **FDensity**, **FCenter**, and **Tweak** are the most important adjustments to getting the perfect spread and balance. So, the number of **Sweeps** will almost always need to be selected first!

FDensity and **FCenter** control how many of the **Sweeps** are 'squeezed' around a certain frequency. Too high a density may make the sound less pleasant, and usually you'll find a moderate **FDensity** value at the right **FCenter** to be the best, instead of extreme values.

Add the DLA-X

Before we add it, listen to just one channel, left or right. At this point, the sound of each side will be very unusual because only some of the frequencies are present. In headphones, this could cause listening fatigue, or if in speakers, each ear might feel “deaf” to this missing frequencies. Crossfeed delays will help to fill in the holes in the frequency response and increase the stereo effect.

Make sure the Delay is still set to 7.0ms (milliseconds). While listening to the stereo output, **slowly increase Xfeed** to about 0.70, or less.



As you do increase the Xfeed level, the stereo effect will become richer. If you wish, listen again to just one channel or the other and you'll hear that now each side is much more normal-sounding because the frequency response has been restored.

Change the Delay value to alter the stereo effect to your liking. In general, pop music and speech can use delays from 5 to 12ms, and classical/jazz from 10 to 20ms.

If the Clip window in the DLA turns red, then click the Trim window once to reduce the input automatically. You can also reduce the input gain to the PS-Spread 3 to 4dB.

Summary

Suggested steps for using PS22, listed in order from basic to fine adjustment:

- Decide whether to use **Spread** or **Split**.
- Choose the number of **Sweeps**.
- Adjust **Spread** and **LFSpread** for desired image width.
- Drag **Density cursor** to adjust the flavor of the image.
- Adjust **Tweak** to center the image.
- Add the **DLA-X** if desired.
- You can adjust any of these at any time; this is merely a starting point.

Tips

- Use a low number of Sweeps for stereo positioning, higher numbers for diffusion.
- Split is best for mono sources when you want the most dramatic stereo.
- Set the XFeed just high enough to enrich the signal, or so that each soloed channel has acceptable frequency response.
- Split and XSplit allow you to change the Shape, so you have the power of the Spread without having to change the plug-in.
- Keep FDensity at a moderate setting, such as .6 or less to avoid higher degrees of comb-filter coloration.
- Spread the low frequencies more than the highs (LFSpread >= 1.0) for very intense effects.

Chapter 5 - Setup library and applications

For explanations of each of the Factory Presets (permanently in the Load menu), please see Appendix A. Information on how to use the Load and Save menus—including putting your own presets into the menu—is in Appendix B.

Because the strongest effects of the pseudostereo processes use two plug-ins, the Setup Library is a little more complex than with other Waves processors.

Each name of a setup has the format:

description.otherplug-in

which means that the other plug-in to use with the one you're using will be in the name.

For example, if you load the PS-Spread(10) setup file, you'll see "Diffuse 1.X" in the Load popup, which shows that you should use the DLA-X after the Spread plug-in.

(If it said "Rock 2.XL", then you would load the DLA-XL after it. And so it goes.)

Next, in the DLA-X, you would load the DLA-X setup file, and you'll see "Diffuse 1.Spread(10)" in the Load popup, which you would select. You can see that the name of the setup is telling you to use the Spread(10).

In other words, select the same setup in both plug-ins, when indicated. Of course, some setups don't require the DLA-X plug-ins, and they will have a simple name. This doesn't mean you can't use the delay crossfeeds. If it sounds good to your ears, just make sure you're not breaking any local laws or regulations of stereo-image width boundaries. Stay out of trouble.

Types of setups in the library

Three categories of setups have been developed for the PS22, and there may be more as time passes. These divisions are not into separate files, but are distinguished by the name of the setup since there are not so many setups in this library. Instead, it's better to provide good starting points for you to adjust to fit the source. From time to time, you might want to check the Waves web page to see if any updates or tips have been posted, at www.waves.com.

Positioning/low diffusion

Taking a mono input and repositioning parts of the mix into different areas of the stereo output image can be used for historical recordings—such as 78rpm or classic pop music from several decades ago, in remixing of records that had a low number of tracks—such as the 3-track masters from the same time, or for split-band processing where the phasiness of a crossover is undesirable.

Setup names that specifically reposition certain frequency bands are clearly named. For example:

BassLeft OtherRight would clearly put most of the bass on the left.

BassRight OtherLeft opposite of above.

Combinations of positioning and low diffusion may indicate application or technique.

Gentle Stereo Enhancer intended for enhancement of stereo masters that need a little help.
MonoRemaster.X could be used as a starting point for stereoization of archival recordings.

High diffusion

High numbers of Sweeps and more extreme Spread settings may make these setups limited to special applications, such as lead instruments, over-the-top production techniques, multimedia, film mixing, and ambient texture manipulation. For example:

Diffuse 1.X

(see the Setup Library documentation for info on these)

VeryDiffuse 1.X

Rock 1.X

Rock 2..X

Enhancers

These are good templates for multi-track mixing or mastering tweaks. They can be used several times in parallel on many tracks for subtle image expansion of each track, or on a full mix to enhance the dimension of each sound. You should feel free to use any combination you like, for any application; all setups here are intended as starting points or examples for you to learn from or work with. For example:

Gentle Stereo Enhancer (for Spread) which is nice for mastering/
remix applications.

Medium Stereo Enhancer intended for enhancement
of existing stereo masters.

Here is a graphic representation of a mixing example with several mono inputs, each with a PS-Spread inserted on the track. Rotation on each PS-Spread is used to pan the track to the final mix position, and a moderate amount of Spread is applied—a good range is 0.2 to 0.4—and a low number of Sweeps is used, say from 3 to 8.

For most conservative applications, it's best to have the Rotation set so that after the Spread is added, the outside “edge” of the sound would not be beyond the speakers; in other words, wider than the LR lines on the PS graph. For example, you might set Rotation no higher than +/-30 degrees, then have Spread about 0.25. You can see on the PS graph below that half the width of the light blue spread area is about the same as the distance from the lower Center marker to the Left line. Therefore, the sound that was Rotated to the position of the Center marker will be spread to almost exactly the left speaker.



Over the top

Of course, you can ignore all these recommendations. By pushing the Spread envelope beyond the LR lines on the graph, those frequencies will be antiphase, and give distinctive beyond-the-speaker effects.

For surround film mixing, the encoders will certainly push these antiphase components into the surround matrix, which could be quite desirable, but you should be aware of this effect.

Standard stereo mixing can benefit from use of antiphase material simply for the intense effect, but it may be tiring or irritating in headphones, depending on how much you care about that. We suggest you check your mix on both headphones and speakers on any mixing that uses advanced pseudostereo processing.

Section 2 - In-Depth topics

A word about Phase

A common problem with “stereoizer” effects, is that they have an inherent phase difference between the channels. In natural stereo material there will be mostly amplitude differences between the two channels, this is also the case when you use pan-pots to pan mono channels into stereo outputs. Any inter-channel phase differences results in poor mono compatibility, and can be very fatiguing to listen to. PS processing does not have inter-channel phase differences; all the phase added by the PS processing is **completely identical** between the two channels.

Using PS with Waves S1

If you also wish to use the Waves S1-Stereo Imager to process existing stereo input sounds, you are advised that this will work best with minimum coloration if the S1 is before the PS22 processing. With the exception of gain and rotations controls, S1 processing after PS22 modules is not recommended.

However, if despite these recommendations, you find that the subjective effect of S1 processing after PS22 processing is acceptable by ear, go ahead and use it. This is especially the case when you apply S1 processing on a total stereo mix whose individual tracks may have had separate PS22 processing applied. Any small coloration effects on individual tracks will often not be audible within the total mix. This will especially be the case where the degree of spread processing is small, for example if used to obtain a subtle “sound source size” effect on each component of the stereo mix.

Using PS with Waves TrueVerb

If you also wish to use the Waves TrueVerb reverberation/distance processor, this also may be used either before or after PS22 processing, In this case the effect is subtly different in the two cases, but the differences may be difficult to hear. However, it is generally not advisable to use TrueVerb through-mode processing before the PS-Spread or PS-Split processors unless their input width is set to 1, since a narrower width will degrade the spaciousness and distance effect of the TrueVerb effect.

Generally speaking, use of DLA-X with TrueVerb in through-mode is not generally recommended unless the TrueVerb early reflections are switched off and only its reverb used, since this can degrade the distance effect of TrueVerb. However, when used with PS-Spread or PS-Split, TrueVerb through-mode gives a similar enhancement to what otherwise would be achieved by cascading with DLA-X, with the added bonus of a spatial simulation and reverb effect.

The following processing chains are recommended with use of through mode TrueVerb and PS22 modules.

Spread -> TrueVerb

Split -> TrueVerb

S1 -> Spread -> TrueVerb

S1 -> Split -> TrueVerb

S1 -> TrueVerb

Stereo inputs

All PS22 processes have the unique facility of processing not just mono sounds but complete stereo mixes as well, i.e. they are true stereo-in/stereo-out processes. When processing stereo inputs, all PS22 processes continue to have a flat frequency response for sounds in any stereo position, i.e. the total reproduced energy into the room from the two stereo loudspeakers is the same as for the input stereo signal. The spreading and pseudo-stereo effects are obtained purely by repositioning different stereo frequency components within the stereo stage, not by altering their levels. This means that any tonal alteration is minimized.

For any non-central stereo input position, the effect of a PS22 process is the same as that for a central mono input sound except that the overall spreading or pseudo-stereo effect is displaced or rotated toward the left or towards the right, depending on whether the input sound was towards the left or the right. This means that any spread or enhancement effect is applied separately to each sound position in the stereo stage, allowing every input sound position to be broadened or spread around its own individual stereo position. If for example, a mix with 3 sounds at half-left, center, and half-right were input to the PS-Spread, each of the sounds' image is spread around their own position.

This effect can be used to give each sound image within a complete stereo mix or submix a finite “spread” image size. This allows simulation of the finite size of actual sound sources rather than the very narrow point sources usually produced by stereo panning of mono sources within a stereo mix. This helps create a more natural virtual reality simulation in stereo mixdown of mono tracks of the sound qualities of natural live sound sources. For this effect, which is subtle, one will often use a moderate degree of spreading such as maybe Spread=0.25.

Spreading can be used also to make the most of a stereo mixdown from very few tracks, e.g. from 4 mono tracks. Normally when mixing down from so few mono tracks, the stereo image is rather sparse, with 4 mono sources with nothing in between - the effect for example found on many pop/rock mixes from the 1960s such as Beatles tracks of the Revolver/Sgt. Pepper era, and also on many recordings made on home 4-track machines. By spreading one or more of these tracks, panned to different positions, a more “full” stereo mix can be obtained.

However, when spreading already wide stereo inputs, especially when using large amounts of spread, the overall results can become excessively wide and unpleasant to listen to. As with all good things, it is possible to overdo spreading effects.

For example if one uses a wide spreading effect such as Spread = 1.2 that spreads a central mono sound all the way between and even beyond the two stereo loudspeakers, then the effect of that degree of spread on stereo images to either side of the stereo stage can be to push extreme stereo positions so far beyond the loudspeakers that they become unpleasantly out of phase, giving an unnatural and tiring effect.

The cure in such a case is a combination of two strategies:

- use smaller degrees of spread, which pushes the sound less far to either extreme left or right, e.g. a Spread of say 0.4 or 0.5, and
- set the input width to less than 1 so as to pull in towards the center the outermost stereo positions in the input stereo signals. A Width of perhaps 0.6 or 0.7 may be suitable.

With this kind of strategy, the spread on the outermost images is about an image position not at the edge of the stereo stage, leaving some room for additional spreading that reaches the loudspeakers. Generally, on stereo mixes, this kind of less-width/less-spread strategy will give less fatiguing and more pleasant results than attempting to use maximum width and maximum spreading.

The rotation control on the input of the PS-Spread or PS-Split module can be used to “pan” a narrowed stereo image towards the left or the right of the stereo stage - a typical setting may be width = 0.4 and rotation = -20 or +20, which pans an input stereo signal on the left or the right half of the stereo stage only. Modest amounts of additional spreading may then be applied to the results.

The Graphic display is very helpful to showing you the amounts of width, rotation, and spread to use. In the graphic below, the Rotation and Width are set so that with a rotation of 20 degrees, a fully right sound source on the input will still not be beyond the right speaker on the output - this is by setting Width=0.45. As you can see, the right marker is slightly to the left of the Right grid line. Moderate amounts of Spread won’t “push” the image too far beyond the Right grid line, but you may need to reduce Width for greater values of Spread.

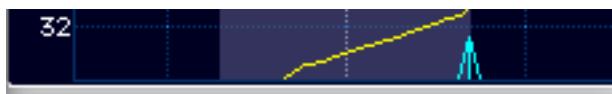


Spreading non-central mono sounds

Similar considerations apply to spreading mono sounds about non-central positions.

In PS-Spread or PS-Split a central mono sound can be panned towards the left or right by using the rotation control as a pan-pot control, and a spread effect added to the resulting non-central position. This is ideal for multi-track mixing with a PS on selected mono tracks; simply Rotate each signal to pan it where desired, then set Spread to the amount of image enhancement you want. As before, if a spread is used that is too large, this can result in some sounds being pushed so far beyond the stereo speaker nearest the panned sound position that the results become unacceptably fatiguing. Therefore, this works best with more moderate degrees of spread, especially when the panned position gets close to one loudspeaker or the other.

Again the Graphic display can be helpful to judge what degrees of Spread/Rotation are suitable. As can be seen below, the amount of Spread (indicated by the blue shade) if centered around the Center marker, would not push too much of the signal beyond the Right grid line.



Subjective comments and hints

StereoMaker pretty much works “straight out of the box” in giving stereo enhancement effects, and it requires only a little playing around with it to come up with a range of good-sounding stereo effects. However, a beginning user will obviously not immediately tune into all the subtleties of what can be achieved with extended use. As with all audio processing, there is a learning process to get the very best out of it - a learning process that is never-ending. Even the most experienced audio professional continues to learn new things about using familiar audio tools with experience.

Obviously, the more experience one has using StereoMaker processing, the more one’s ears will become attuned to various subtleties of the processing. As with all audio processing, there is no substitute for experience to get the very best possible results. Because StereoMaker has been designed not just for impressive stereo effects, but also to avoid equally impressive (!) unwanted fatiguing side-effects encountered with some other processes, a regular user of StereoMaker will start noticing various subtleties in use that would be swamped by defects in other processes.

These notes are designed to draw your attention to some of these subtle effects so that you can, as rapidly as possible, learn how to make decisions in using StereoMaker processing with best possible results. Suggestions are also made as to ways of achieving particular kinds of effects.

Processing Aims

Generally speaking, when creating a stereo effect from a mono source, one is after one or more of several different effects.

One effect one may seek is actually to position individual sound sources in particular parts of the stereo stage, e.g. double bass to the left and snare drums to the right.

A second effect one may seek is to “diffuse” the stereo position of the original sound, so that it is spread across a part or all of the stereo stage but without any particular directional effect within the stereo stage.

A third effect one may seek is to create a more convincing spacious effect.

StereoMaker provides tools that allow many different combinations of these three aims to be achieved.

The first effect of providing different positions for different sounds is best achieved using PS-Spread and PS-Split with low sweeps settings, using perhaps sweeps 2, 3 or 4.

The second effect of diffusion of stereo position is best achieved by using PS-Spread with a high number of Sweeps — at least say 12 and possibly up to 22, and preferably with an FDensity more than zero, maybe 0.4 or thereabouts. The DLA-X effect on its own can sometimes achieve a useful diffusion effect too.

A combination of stereo positioning and diffusion can often be achieved using PS-Spread with medium sweeps settings, say around 8 Sweeps, perhaps with some added DLA-X processing.

A spatial enhancement effect can be achieved by using low or medium sweeps PS-Spread or PS-Split effect followed by DLA-X processing.

Sweeps, Spread statistics, and coloration

StereoMaker processes avoid frequency response alterations by ensuring that the total energy output from the stereo speakers is the same after processing as it was before. But this does not mean that no tonal alteration at all is heard, since the very fact of altering stereo positioning in a frequency-dependent way has a perceptual effect on tonal quality and coloration.

Among the subjective effects that can occur is “comb-filter coloration”. This effect is difficult to describe in words but is obvious once one has heard it. In extreme form, it is the kind of strange “robotic-sounding” effect that creative delay effects units can produce when set to short delay settings.

This effect, to a much more subtle degree, occurs when there are very rapid and large changes of stereo position to-and-fro as frequency is varied. It shows up most when both the degree of spread used is large and when the number of to-and-fro sweeps per octave is large, for example for high sweeps processing with the FDensity control set to large positive values.

Comb filter coloration is smallest with low sweeps processing, narrower spreads and with smaller settings of FDensity.

Generally, to minimize or eliminate any hint of comb filter coloration, lower-Sweeps PS-Spread processing can be used, with Sweeps below 10 or 12, and with modest settings of the FDensity control.

High sweeps settings around 20, especially with higher FDensity setting such as 0.3 or more, can produce audible, although still subtle, coloration when used with spread setting of 0.6 to 1.2. You can see clearly from the display graph when the risk of coloration is highest by noting when the to-and-fro wiggles are packed very close together on the display, especially at middle frequencies.

On the other hand, such high-sweeps/high-density spread settings have the advantage of a very diffuse stereoism, where individual sound sources are diffused across the stereo stage. Lower-sweeps/lower-density settings tend to clearly position individual frequency ranges more sharply at different stereo positions, sometimes leading to unwanted “splitting” of the stereo image to different positions.

So the tradeoffs between smooth stereo diffusion and coloration need to be decided by the user’s judgment - this is one aspect where experience and skill in listening to StereoMaker can allow improved decisions. It is also the reason why a wide range of both sweeps and density adjustments are provided with StereoMaker, so that the user can make the best tradeoff for every program material.

Mono compatibility

An issue that is often important is mono compatibility, i.e. what happens when a stereo sound is later heard in mono, especially if the stereo recording is broadcast and picked up by a mono radio or TV receiver, or if a stereo multimedia soundfile is played via a computer with mono sound.

There are two different issues in mono compatibility - whether any sound component is diminished too much in level relative to others so that sound balance and intelligibility is seriously affected, and other issues of how good the sound quality is. Within limits, the sound quality issue is less important, as typical mono reproducers are rarely of high sound quality anyway, but the sound balance issue is more important.

Ideally, a stereo processing algorithm will have perfect mono compatibility, i.e. the mono reduction of the synthesized stereo effect would be the same as the original mono or the mono reduction of the original stereo (assuming that the original stereo was mono-compatible in the first place...). Unfortunately, it can be shown that a pseudostereo algorithm that gives essentially perfect mono compatibility gives a very phasey effect in stereo unless the synthesized stereo effect is very narrow or if a degree of tonal alteration is accepted.

The PS22 algorithms are optimized for good synthesized stereo effect, but are so designed that generally the mono compatibility is still subjectively good, while not being quite identical to the original mono.

With PS-Spread or PS-Split algorithms, the mono compatibility is generally very good for smaller degrees of spread, and starts getting slightly worse as the degree of spread is increased. For spread = 0.6, the frequency response of the mono reduction ripples up and down by about +/- 0.67 dB, increasing to a ripple of +/- 1.5 dB for a spread of 1.0 and +/- 1.94 dB for a spread of 1.2. For high sweeps spread algorithms, there are several such ripples per octave and consequently the effect is usually not very audible. If a cascaded DLA-X is used, generally these frequency response ripples are largely filled in by the delayed sound, although some comb filter coloration can then become audible - but again this is generally at acceptable levels. Any comb filter coloration effects using DLA-X can be reduced by lowering the delay gain (XFeed).

If the user is concerned about mono compatibility, this should be checked by monitoring the output in mono as well as stereo, but in most cases, mono compatibility is very acceptable for less critical mono reproducers.

If mono compatibility is of paramount importance, care should be taken to use as little spread as is necessary to achieve a usable stereo effect, and/or use of some of the Q10 pseudostereo effects should be considered - but these generally give a much poorer stereo effect than the PS22.

The DLA-X process applied to central mono inputs is always fully mono compatible.

A workaround when mono compatibility is critical

Here is a workaround with PS-Spread that can give improved mono compatibility in the most critical situations when processing a mono original sound. Insert an S1 Stereo Imager after the PS22-Spread module, as shown:

PS-Spread -> S1 ->

Set the S1 to a Width of 1.4, and setting the Spread on the PS-Spread to about 0.7 of the value you would normally use. This has the effect of giving essentially the same stereo effect, but now distributes the frequency response ripple partly in the stereo sound and partly in the mono sound, halving the total degree of frequency response ripple in each mode separately compared to what would otherwise happen in mono.

When is a mono input mono?

When PS22 processes mono inputs, the assumption has been made that one has a central mono input signal in the two input stereo channels.

However, it is worth warning that often, especially when playing an historic mono tape on a stereo analog tape recorder, that an apparently mono input may not be seen as true mono by a PS22 module, because of amplitude and phase differences between the two playback channels of the stereo tape head.

The ideal solution here is to carefully azimuth the playback head so as to put the two channels maximally in phase, and then to reduce to mono at the input of the PS-Spread module by setting width = 0. But this will only give good mono results if the azimuth is accurately adjusted, with phase differences less than say 45 degrees at 12 kHz - the maximum interchannel phase error tolerance used by the BBC for mono compatibility.

Often effects such as tape weave (continually varying azimuth) can prevent historic tapes - especially at lower speed or on cassettes - maintaining this degree of accuracy, and in such cases, paralleling to mono in the input of the PS-Spread or PS-Split module can cause significant alterations of high frequency tonal quality.

In such cases, one can alternatively use the PS-Spread or PS-Split processing without reduction to mono, by using a width equal to 1, or can compromise say by using a width of say 0.6 rather than 0. This will retain more of the original tonal quality and generally still give a good pseudostereo effect. This is one advantage of the PS22 using a true stereo-in/stereo-out process. The downside of not reducing to mono before processing is twofold: (i) mono compatibility can remain poor if the processed recording is later played in mono - although sometimes using the PS22 processes can actually improve mono compatibility in this situation, and (ii) one does not get the improvement in noise performance, typically 3 dB, occurring when paralleling to mono.

Hint

The PS22 or the S1 can be used to adjust azimuth on mono material if used in a real-time processing mode. The method is to set the input width to zero, and click on one of the two input polarity buttons to read “ - “. This causes the sound coming out to be the difference of the two stereo channels. Then adjust the azimuth of the tape recording to minimize sound output - the level (especially in the treble) will be minimum when the azimuth adjustment is correct. This method of adjustment is much more accurate than the normal method of maximizing treble output.

The technical bit

Many users like to know a bit about what is going on technically within a processor. While the full details of PS22 processing are proprietary, the following information may be of interest.

The three modules PS-Spread, PS-Split and DLA-X are all linear processes, involving neither any level-dependent dynamic processing nor any time-varying effects. In essence, they are simply complicated linear filters acting on two stereo channels, with filter cross-feeds between the two channels.

Both PS-Spread and PS-Split are based on IIR (infinite impulse response) filters that have the effect of panning sounds to and fro between the two stereo channels. These filters are not conventional minimum phase equalizers, which would result in a high degree of unpleasant “phasiness” in the pseudo stereo effect. They are based on low-Q filtering so that the audible coloration is low. (High Q filters can sound very colored).

In order that a rich and complex spreading effect be obtained, the IIR filters used are of very high order, much higher order than encountered in most audio signal processing. For example, in the sweeps=22 PS-Spread case, the IIR filters in the 4 signal paths left-in-to-left-out, left-in-to-right-out, right-in-to-left-out and right-in-to-right-out are each 46th order IIR filters. In order to preserve audio quality, internal noise shaping is used in the filters to minimize any low-level quantization noise distortion produced by the filters.

The complex IIR stereo-in/stereo-out filtering systems used in PS-Spread and PS-Split processing are designed to achieve three aims.

The first is that they preserve input signal energy, i.e. the total stereo energy emerging after processing, whatever the original frequencies or stereo positioning, will be the same after processing as before. This minimizes any alterations of reproduced tonal quality, any effect heard being solely due to changes in stereo positioning of sounds.

The second aim is low phasiness, i.e. if the input stereo already has low phasiness, i.e. lack of phase differences between the stereo channels, then there will also be no phase differences between the output stereo channels. The exception here is if a sound is panned beyond the left or right stereo loudspeakers to “ultra-wide” positions, when a 180 degree phase difference (polarity inversion) will occur, which means that excessive spreading beyond the loudspeakers, especially at higher frequencies, should be avoided. This is why large amounts of spreading in the PS-Spread module are confined to lower bass frequencies, where the effect of antiphase sounds is far more acceptable psychoacoustically. Interchannel phase shifts like 90 degrees between channels, which cause unpleasant effects even at bass frequencies, are avoided in the PS-Spread and PS-Split processes.

The third aim in the PS-Spread and PS-Split algorithms is the avoidance of any time-delay processing. Many artificial stereo effects are based on heavy use of time-delay effects. These can give spectacular creative results, but generally alter the original artistic and creative effect of the input sound, often adding audible echo effects

The design aim of the PS22 processes generally has been to preserve as far as possible the original artistic intentions of the input sound, altering only its stereo effect. Like many Waves processing products, it is designed to be a highly controllable dedicated tool rather than simply a subjective creative effect. This makes it broadly useful for a much wider range of applications than a purely creative effect would be. For example, it can be applied to remastering historical mono recordings without falsifying original artistic decisions, or applied to each track of a multitrack mixdown.

Varying the various control settings of the PS-Spread or PS-Split processing adjusts most or all of the filter coefficients in such a way as to retain an optimized pseudostereo effect achieving these three aims. Unlike possible alternative and far more complex FIR filter schemes, there is no large time delay introduced by the PS22 algorithms, which allows them to be used in a stereo mixdown without relative time delays between those tracks using spread processing and those not using it.

Stereo Monitoring

It is important before listening to stereo effects to make sure that your stereo monitoring is set up correctly - in particular that your stereo monitor speakers are matched and are in phase, and that the left and right channels are the correct way round! The “left/right” sound file provided with SDII, or the channel identification track on a test CD, can be used for getting them the right way round. Any speech or music mono sound file, especially those with a lot of bass, can be used to get the speaker polarities correct - the image will be much sharper and with more bass if the speaker polarities are correct. If stereo phase is wrong, you may correct it by reversing the “live” and “neutral” send from one of the two stereo power amplifiers to the loudspeaker **ON ONE STEREO CHANNEL ONLY**.

If your stereo amplification system is fed via balanced leads and your speakers are out of phase, it may be that one of these leads is not wired correctly, causing a monitoring stereo phase error. If so, the lead should be replaced or rewired to ensure the same polarity.

If the loudspeaker is bi-amplified, i.e. different amplifiers are used for different frequency ranges, it is important that **ALL** the amplifiers on that channel are used in the same polarity. If in doubt about this, consult the manufacturer of the bi-amplified loudspeaker or a specialist dealer for expert advice on this.

The best stereo monitoring will be obtained if the loudspeakers are set up symmetrically towards the left and right, with the listener placed symmetrically so that he or she is equally distant from them. Normally, stereo monitoring is optimal if the angle subtended by the two loudspeakers at the listener is around 45 to 60 degrees, i.e. if the distance between the loudspeakers is between 0.7 and 1 times the distance of the listener from each of the loudspeakers. The subjective stereo effect heard via headphones will generally not be the same as via loudspeakers. If it is important to know the effect heard on both loudspeakers and on headphones, both should be used to check a stereo mix effect. One cannot with certainty predict the effect for headphone listeners by loudspeaker monitoring or vice-versa.

PS-Spread as an audio phase scrambler—A specialist use

Although the primary use of the PS-Spread processor is to obtain image spreading effects, it has another quite different specialist use that may be of interest to some users in some applications - this is to scramble the relative phases of different frequency components of audio signals without any affect on amplitude response.

Phase scrambling can be used to make asymmetric audio waveforms such as speech, having signal peaks in one polarity much bigger than in the other polarity, more symmetrical, and can also reduce the peak signal levels of some unprocessed audio signals without affecting their average levels. Phase scrambling can thus be used to make audio signals better behaved for applications like radio transmission by reducing extreme peaks. It can also be used before peak limiters such as the Waves L1 Ultramaximizer to reduce the degree of limiter processing required.

However, phase scrambling should generally not be applied after peak limiting, since its effect then will be to increase peak levels, often by substantial amounts.

The PS-Spread processor is set up as a phase scrambler by setting width equal to 1, rotation equal to 0, spread equal to 0, and with LFSpread set to x 1.

In this mode, the stereo output is identical to the stereo input, except for any gain alteration and phase scrambling.

You can get an idea of the way the phase is being scrambled as a function of frequency by looking at the spread graph when Spread is reset to say 1.2, returning to 0 for the actual processing. The Sweeps control adjusts the order of phase scrambling from just one to 21 pole/zeros as Sweeps is set from 2 to 22 respectively, so that you have complete control as to how much phase scrambling is applied. In addition, the FCenter and FDensity control may be used to adjust the frequency range to which the most and least scrambling is applied — the greatest degree of scrambling occurring in frequency ranges where the display graph with say, Spread=1.2, has the most wiggles to-and-fro per octave.

Using less Sweeps —such as 8— will often provide sufficient phase scrambling to improve asymmetry of peaks, and will have less potentially audible effect on the phase response of the audio signals. High order processing such as 22 Sweeps will give the maximum degree of phase scrambling, but may also have some subtle audible effects on the audio, causing a subtle “lag” effect on some bass sounds like bass components of drums. This subjective effect can be minimized by using the FCenter and FDensity controls to concentrate most of the wiggles to-and-fro at higher audio frequencies.

Use of the PS-Spread as a phase scrambler has no effect on the relative phase between stereo channels, only on the absolute phase of frequency components. Both channels are affected equally, so that there should be virtually no audible effect in use on stereo imaging.

Q10 Pseudostereo effects

The Waves Q10 paragraphic equalizer already comes with a large setups library of “pseudostereo” effects designed to produce a synthetic stereo effect from mono input material. Here we briefly describe the difference between these effects and those produced by the PS22 StereoMaker.

The PS22 StereoMaker effects are in general much more sophisticated than those produced by the Q10. The Q10 PS effects are generally similar to those in conventional state-of-the-art PseudoStereo devices of a previous generation, in that they have little effect on the overall tonal quality or frequency response, but generally produce a rather phasey effect, and one which is not capable of the wide spread associated with the PS22-spread effect. The Q10 Pseudo-stereo effects, although tonally quite neutral, generally have a high “phasiness” with phase differences between the stereo speakers of typically around 90 degrees - something that is inevitable when using the minimum phase filtering used in the Q10.

Also, unlike the PS22, the Q10 effects can only be applied to single central mono sources, and not to full stereo input mixes.

Despite the generally inferior performance of the Q10 pseudostereo effects, there may be specific program material for which it may be found preferable, particularly for particular sounds within a complex stereo mixdown. Users of both the Q10 and PS22 are encouraged to use whichever effects are appropriate to a given case. However, in most cases, a direct son of a Q10 pseudostereo effect and a PS-Spread effect on the same material shows a clear and very marked superiority of the PS22 effect. The Q10 effect generally sounds much more “mono-ish” and is also much more fatiguing to listen to. This is typical of the previous generation of pseudostereo effects.

PS22-Stereomaker Using the Factory Presets

General

Most of the Factory Presets are compatible with ALL different kinds of PS processors. When loaded to different Processors, each Preset will have a different characteristic. In most of the cases the results are of quite a different nature.

Therefore, it is worth trying them all!

For the few Factory Presets that works only on a specific processor, the preset name begins with the Processor name they are designed to work with.

All Factory Presets will work both on the Mono-Stereo and Stereo-Stereo inputs. For stereo inputs, the effect on Central input sounds will be exactly the same as for the Mono input case.

Descriptions of Factory Presets

Mono Track Enhancer

- Purpose:** Enhancing a mono track within a multi track stereo mix.
- Idea:** The mono sound is processed to have a natural 'width' as if it was recorded with stereo mics.
- Processor:** All PS processors.
Uses all the available Sweeps per processor.
PSXSplit also adds a subtle cross delay.
- Controls:** Increase/Decrease the Spread as needed.
Tweak to center the perceived sound direction.
Rotate to position the track where wanted in the final mix. (!Don't use ProTools or other PanPots!)

L-C-R Stereo Enhancer

- Purpose:** Enhancing a Left-Center-Right stereo mix.
- Idea:** The original stereo width is decreased, and PS Spread is added on top of it. The resulting stereo fills the whole stereo stage continuously, from fully left to fully right, filling up the 'holes' that were in the original mix.
- Processor:** All PS processors.
Uses all the available Sweeps per processor.
PS-XSplit also adds a subtle cross delay.
- Controls:** Tweak to get the most natural sounding result.

Ambient Diffusers (wideband/low/mid):

- Purpose:** Diffuses any sound to be un-localized, coming from all directions. Excellent for ambient sounds such as Jungle, Sea Waves, Explosions, etc.
- Idea:** Each sound source in the input is diffused across the whole stereo stage.
all - gives even diffusion for all frequencies.
low - diffusion is concentrated on low frequencies.
mid - diffusion is concentrated on mid frequencies.
- Processor:** All PS processors.
Uses all the available Sweeps per processor.
PS-XSplit also adds cross delay.
- Controls:** Tweak to control where specific sounds come from.

Mono ReMaster - pop

- Purpose:** ReMaster of mono mixes, to sound as stereo. Suitable for Pop, Rock'n Roll Jazz, etc.
- Idea:** Sweeps are not too dense, so that the mono mix is splitted rather than diffused.
Bass frequencies are left centered (LFSpread is 0).
PS-XSplit uses small amounts of XDelay and XFeed, to avoid repetition of percussive sounds (HiHat etc.).
- Processor:** Best with PS-XSplit, but others can be used as well.
- Controls:** FCenter, FDensity, Tweak and Sweeps can all be used to control where specific sounds come from.
Pay attention that the lead vocals stay centered. You can achieve this by having higher FDensity, over the major frequencies of the lead vocals - so that it will be diffused, rather than splitted to one side or another.

Mono ReMaster - orchestra

- Purpose:** ReMaster of mono mixes, to sound as stereo. Suitable for full orchestra recordings.
- Idea:** Sweeps are not too dense, so that the mono mix is splitted rather than diffused.
Bass frequencies are allowed to be Spread as well.
XSplitted uses large amounts of XDelay and Xfeed, as is typical in concert halls.
- Processor:** Best with XSplitted, but others can be used as well.
- Controls:** FCenter, FDensity, Tweak and Sweeps can all be used to control where specific sounds come from.

Spread 22.Very Diffuse

Purpose: To provide a very intense stereo diffusion effect.

Idea: The highest number of Sweeps to provide continuous diffusion over the entire range. It has a higher FDensity setting in the mids (centered around 7.3kHz) to diffuse mid and higher harmonics, making the output very non-localized. A powerful effect for sound design or lead instruments.

Processor: Spread22 only.

Controls: Sweeps, FCenter and Spread. Reduce Fdensity for less comb-filter coloration.

Grand Piano

Purpose: Creates an effect similar to a stereo mic recording (of a piano) from a mono recording. Also great for Pipe Organ and other BIG instruments.

Idea: Sweeps are not too dense, so that the mono mix is split rather than diffused. Bass frequencies are allowed to be Spread as well. XSplit uses large amounts of XDelay and Xfeed, as is typical in concert halls.

Processor: Best with PS-Spread22.

Controls: If this is a track within a mix, use Spread, and Rotate to locate the sound where wanted in the stereo stage.

Keyboard player

Purpose: Hear a piano (or other keyboard) as if you are playing it...

Idea: The notes are panned from left to right across 4 octaves with 800Hz at the middle (i.e. 200Hz is fully left, 3200Hz is fully right). Higher harmonics, are panned back to the left.

Processor: All Processors. PSSplit is most linear.

Controls: Set FCenter to be the frequency that is panned to the center. Going down two octaves will get to the left, up two octaves will get to the right.

NOTE: Leave FDensity at 0.85!

For subtle adjustments use Tweak.

Using PS-Split, you can change the Shape of how panning is changed with frequency. (The Shape in the preset is set to be most linear)

Set Tweak=-1 to reverse the directions.

Keyboard player, diffused highs

Purpose: Same as ‘Keyboard player’, only the high harmonics are diffused, rather than going back to left.

High Harmonics Unmasker

- Purpose:** Unmask high harmonics of instruments.
- Idea:** High frequencies are easily masked by louder lower frequencies. Naturally high harmonics of instruments are lower in level, plus they come from the same direction. By panning the high frequencies to different directions than the lows, the ear can hear them more clearly.
- Processor:** All Processors.
- Controls:** Use Tweak, to ‘tune into’ specific harmonics and pan them away from the center.

Reduce the Spread so the sound image is only splitted as needed.

HF Diffusion

- Purpose:** Keep the bass and mids centered while diffusing the highs; quite good for mono synthesizers when a stereo effect is desired but you need to keep the bass in the center.
- Idea:** Some sounds, especially bright mono ones, can be rather spectacular if only the highs are diffused.
- Processor:** All processors.
- Controls:** Spread and FCenter to control amount and area where the diffusion occurs. DLA-X is not necessary, but can be used in this way: try the DLA-XL, set the Xfeed to 0.7, Xfeed LF to 0.0, and Freq to 5000 (5kHz). This crossfeeds only the frequencies above 5kHz, and can be a very excellent enhancement for HF Diffusion.

LF Diffusion

- Purpose:** Diffuse only the low frequencies while keeping the mids and highs in their original places. It is very similar to the 10.HF Diffusion, but targeted for low frequencies.
- Idea:** For low frequency content sounds, such as effects and explosions, a stronger impact can be made if the lows “come from everywhere” (depending on source material).
- Processor:** PS-Spread22 and PS-Spread10 only.
- Controls:** Adjust Spread and FCenter to localize the effect. The DLA-X is recommended, and you might try the XLB in order to play with the Bass Delay toggle; it may give you better or worse subjective bass response, depending on the source.

Male/Female Speech

- Purpose: Enhance mono recordings of speech.
- Idea: A Subtle spread on the mid-low frequencies of speech, gives it a softer, and more personal sound. Frequencies of female voice are typically higher than male.
- Processor: PS-Spread22 only.
- Controls: Set Spread according to taste.

PanQualizer

- Purpose: As an Equalizer can change the gain of selected frequencies, so can these setups change the Pan of selected frequencies.
- Processor: All.

High/Low Shelves Presets:

LF-Left X HF-Right - lows panned to the left, highs to right. LF-Right X HF-Left - lows panned to the right, highs to left.

- Idea: Lows/Highs are panned as each Preset name suggests. The transition between lows and highs is similar to a Shelf filter in a normal Equalizer.

- Controls : The Shelf frequency is controlled by FCenter.

Controlling the Shape in PSSplit is similar to controlling the 'Q' of a filter. The shape of PSSpread is equivalent to that of PSSplit when Shape=0.15.

For Spread=1.0 panning is all the way from full-left to full-right. For smaller values of Spread panning is less extreme.

NOTE: The only difference between the two setups is that Tweak=-1 in the later.

- LF-Center X HF-Right - lows panned to the center, highs to right. LF-Center X HF-Left - lows panned to the center, highs to left.

- Idea: Same as above only the Lows are panned to Center. To achieve this Spread is set to 0.42, and the whole image is further rotated by 22.5deg. This brings the lows back to center, and takes the highs all the way to the right (vise versa on the second setup).

- Controls: FCenter - as above
Shape - as above.

Hint: By setting Spread to any value, and setting Rotation so that the wanted frequencies comes back to the center, you can get to any low/high panning relations.

Just as you can control levels with a shelf filter + input gain.

(You will note that to bring frequencies from one side of the blue shade to the center, you need to exactly match the tip of the rotation marker - blue triangle - with the other side of the blue shade.)

Bell Presets

All-Left X FrqBand-Right - all panned to the left, selected frequency band to right.

All-Right X FrqBand -Left - all panned to the right, selected quency band to left.

Idea: As above, only instead of the low/high shelf behavior, here we have a frequency band Bell.

Controls: FCenter - controls the center of the frequency band.

Shape - controls the 'Q' of the frequency band.

All-Center X FrqBand-Right - all panned to the center, selected frequency band to right.

All- Center X FrqBand -Left - all panned to the center, selected frequency band to left.

Idea: As above.

Setup Library Notes

Waves PS22-StereoMaker Setup Library Guide

Introduction

In general, the setups can be divided into three categories, which are described in the PS22 User's Guide, in Section Two: In-Depth Topics, in the section "Processing Aims".

These three categories are:

Diffusion usually with higher numbers of Sweeps; the spreading of frequencies across the stereo stage in a non-localized manner. Positioning using a low number of Sweeps; placing rather wide, specific bands of frequencies at certain points in the stereo stage (such as putting the bass on one side and the snare on the other.) Combination (of diffusion and positioning) usually with a medium number of Sweeps, creating a rich stereo effect, with some positioning of frequencies, and light diffusion of the overall spectrum.

In addition, there are some setups that are extreme, for 'over-the-top' effects, which may have a lot of antiphase material, making it very tiring to listen to, and therefore, unsuitable for most work.

Differences between Factory Presets and Setup Library

Factory Presets (the permanent settings in the Load menu) were carefully designed to provide a wide range of starting points that don't necessarily require the DLA-X plug-ins. They also can be used with all PS plug-ins relatively well (Spread, Spread-10, Split, XSplit). However, for best stereo imaging and headphone compatibility, the DLA-X is recommended, especially when Spread is above 0.4 or so. It's your decision.

The Setup Library is a group of more specialized settings that have matched setups for the DLA-X plug-ins, and work best when you insert a DLA-X (or XL, or XLB) after the PS plug-in. Therefore, you'll find two setups with the same name: one for the PS, and one for the DLA. The Factory Presets have straightforward names.

Of course, you can mix and match any way you like. The presets and setup library are hopefully good starting points for you to work with, along with the User's Guide, which has very important information about using the PS/DLA system.

How the setups are named The number of sweeps needed is the first number in the setup name. The name of the setup is next, followed by the DLA-X plug-in recommended, if shown. (If there is no plug-in listed, then DLA is not necessary, but optional).

Example: 9.LF Diffusion.X would mean that 9 Sweeps are needed, so any PS plug-in can open it; the name of the setup is LF Diffusion, and DLA-X is recommended after it. Then, in DLA-X, you should open the setup with the same name (LF Diffusion), which will be called: LF Diffusion.Spread

How to adjust setups

Each setup has the Spread value already set to a relatively high value (for that setup), so it would be best to start there and lower it to fit the job. This makes quick comparisons easier from the menu. You can use Spread and Split interchangeably according to your preference, but the setup name will show the original plug-in it was designed with.

Most setups are designed for use with the DLA-X plug-ins (some don't need it). By doing this, they provide the best sound, highest compatibility for speaker or headphone use, and balanced frequency response in each channel.

Setup listing and descriptions

Diffusion setups

For PS-Spread 22.Diffuse 1.X 10.Diffuse 2.X 22.Very Diffuse 1.X 10.HF Diffusion 9.LF Diffusion.X 8.MonoRemaster.X

for PS-Split Rock 1.XL Rock 2.XL Lead Guitar
(can be used with DLA-X or in XSplit) Very Diffuse
(can be used with DLA-X or in XSplit)

Positioning

For PS-Spread 3.LowRight OtherLeft 3.LowLeft OtherRight

For PS-Split BassRight OtherLeft BassLeft OtherRight

Combination

For PS-Spread Default setting 8.MonoRemaster1.X 8.Gentle Stereo Enhancer

For PS-Split Default setting Acoustic Instruments 1 Medium Stereo Enhancer HF Directional Unmasking

Descriptions

Default setting -all PS components have the same general default setting, but with important differences. The default is designed to give strong stereo imaging, good adjustability, and compatibility with all four PS component plug-ins (Spread, Spread-10, Split, XSplit). Since the Splits have controls and algorithms the Spreads do not, then the default will certainly sound different, but the idea is the same: a strong general-purpose setting, more diffusive than positioning.

DiffusionFor PS-Spread

- 22.Diffuse 1.X - a strong diffusion, using 22 Sweeps, plus a low frequency spread greater than the highs. The ear is less sensitive to antiphase components in the low frequencies, so the LFSpread is set to 1.5 (50% bigger than the highs) to give a very big, diffused effect. Adjust the Fdensity, Fcenter, and Spread controls. Use the DLA-X after the Spread and load the Diffuse 1 setup from the DLA-X setup file. Adjust the Xfeed and Delay controls; the Delay time is set to a medium value, and can be shorter for pop, longer for classical.
- 10.Diffuse 2.X - a medium diffusion, using 10 Sweeps (which makes it work with either Spread plug-in). This one has LFSpread set to 2.0, for greater diffusion in the bass, but may be too much for some sources. The DLA-X is very beneficial to this setup. Adjust Fdensity, Fcenter, and Spread. Reduce LFSpread to put the bass more in the center.

- 22.Very Diffuse 1.X -a very intense effect that is best with DLA-X, this setup has a higher FDensity setting in the mids (centered around 7.3kHz) to diffuse mid and higher harmonics, making the output very non-localized. A powerful effect for sound design or lead instruments. Adjust Sweeps, FCenter and Spread. Reduce Fdensity for less comb-filter coloration.
- 10.HF Diffusion - keeps the bass and mids centered while diffusing the highs; quite good for mono synthesizers when a stereo effect is desired but you need to keep the bass in the center. It can also be used as a HF Directional Unmasking setup (see the setup with that name for more info). Adjust Spread and FCenter to control amount and area where the diffusion occurs. DLA-X is not necessary, but can be used in this way: try the DLA-XL, set the Xfeed to 0.7, Xfeed LF to 0.0, and Freq to 5000 (5kHz). This crossfeeds only the frequencies above 5kHz, and can be a very excellent enhancement for HF Diffusion.
- 9.LF Diffusion.X - very similar to the 10.HF Diffusion, but targeted for low frequencies. The highs are still spread a bit, so adjust the Spread and FCenter to localize the effect. Quite good for bass-centric sounds when you want the low end to “come from everywhere”, or for big sound effects that need very wide stereo imaging, or antiphase components for surround. The DLA-X is recommended, and you might try the XLB in order to play with the Bass Delay toggle; it may give you better or worse subjective bass response, depending on the source.

for PS-Split

- Rock 1.XL - intended for rock instruments or tracks, but can be used to create a strong stereo image of any source. The bass is left centered, but can also be spread by lowering the FCenter value. Adjust the Spread and FCenter. Highly recommended is the use of the DLA-XL setup for most spectacular image and frequency balance in each channel.
- Rock 2.XL - a variation on the Rock 1.XL, with all frequencies being spread (by a lower FCenter value).
- Lead Guitar (can be used with DLA-X or in XSplit) -developed exclusively with lead guitar sources, this setup has an even wider spread of high frequencies than the Rock 1, but with the bass still centered. Best with the DLA-XL setup. Adjust FCenter and Spread to control the targeted frequencies.
- Very Diffuse (can be used with DLA-X or in XSplit) -a general purpose high-diffusion setting across all frequencies. Adjust the FCenter to reduce spreading of the bass; adjust Spread and Sweeps to taste.

Positioning

For PS-Spread

- 3.LowRight OtherLeft -fairly obvious from the name, the low frequencies are panned to the Right, all others (except the very very top end) to the left. Can be used to split and then reposition mono mixes (such as moving the upright bass to one side for processing and remixing), or for split-band processing in sound design.
- 3.LowLeft OtherRight -the opposite of the setup above.

For PS-Split

LowRight OtherLeft -fairly obvious from the name, the low frequencies are panned to the Right, all others (except the very very top end) to the left. Provides a stronger separation than the Spread version. Can be used to split and then reposition mono mixes (such as moving the upright bass to one side for processing and remixing), or for split-band processing in sound design.

LowLeft OtherRight -the opposite of the setup above.

Combination

For PS-Spread

Default setting - with 16 Sweeps (10 Sweeps for Spread10 and Split). This is a good general-purpose setting for almost any input. It is more diffusive than positioning, but can be made to have more positioning by lowering the FDensity to negative values. The LFSpread is set to 1.5, making the bass spread out more than the highs (by 50%) to enhance the overall spaciousness. Adjust Spread for overall effect, reduce LFSpread to center bass, slowly drag the square FCursor to adjust FDensity and FCenter simultaneously. Finally, use Tweak to center the overall image.

8.MonoRemaster.X -intended for use with mono material, such as old recordings (it was developed using vintage orchestra and Les Paul/Mary Ford records). The medium number of sweeps gives some stereo positioning and diffusion. By using this setup with the DLA-X, a very rich stereo can be made that has strong frequency balance in each channel (very suitable for speaker or headphone listening). Adjust the FCenter and FDensity together by dragging the square FCursor slowly to tune the effect; adjust Spread and Tweak for desired width and positioning.

8.Gentle Stereo Enhancer -intended for enhancement of existing stereo masters that need a little help. For example, anything with “point-source” sounds, such as MIDI mixes, single-mike recordings (that’s almost all recordings these days), or mixes with few tracks, such as 3-track historical mixes, or 4-track “semi-pro” studios. Sometimes, a mix might have several voices mixed directly in the same position, and this setup can give them some air. With only 8 Sweeps and a low Spread value, each sound will be gently expanded to a greater width. Adjust Spread, generally below 0.4, and FDensity up to 0.3; adjust LFSpread from 0.0 to 1.0, depending on your taste.

For PS-Split

Default setting -with 10 Sweeps (16 for Spread), it is a good general-purpose setting for almost any input. It is more diffusive than positioning, but can be made to have more positioning by lowering the FDensity to negative values. Adjust Spread and Sweeps, then drag FCursor slowly to position sounds. Finally, adjust Tweak to center image. For even stronger effect (if you’re not using the XSplit) add the DLA-X Xfeed. A good starting point for the DLA-X Xfeed value is the same as the Spread value (if Spread=0.7, set XFeed to 0.7 to start with).

Acoustic Instruments 1 -designed using acoustic stringed instruments as sources, for the purpose of submix stereoization, or for enhancement of acoustic recordings, whether mono or stereo. The low FCenter value spreads almost the entire frequency range, and the relatively low Spread value makes this more of an enhancement than a spectacular stereo. Use of the DLA-X is not necessary, but can be useful for higher Spread values, and may be needed to compensate for the low Sweeps value (which is appropriate for acoustic instruments). Adjust Spread, FCenter, and Tweak. Leave Sweeps at a lower value to have better positioning effect.

Medium Stereo Enhancer -similar to the Gentle Stereo Enhancer for the PS-Spread plug-in, but with sharper splits in the imaging. Intended for enhancement of existing stereo masters that need a little help. For example, anything with “point-source” sounds, such as MIDI mixes, single-mike recordings (that’s almost all recordings these days), or mixes with few tracks, such as 3-track historical mixes, or 4-track “semi-pro” studios. Sometimes, a mix might have several voices mixed directly in the same position, and this setup can give them some air. With only 7 Sweeps and a low Spread value, each sound will be gently expanded to a greater width. Adjust Spread, generally below 0.4, and FDensity up to 0.3.

HF Directional Unmasking -more gentle than the Factory Preset by having a lower number of Sweeps, moving the top 6 octaves -in 2 octave groups- slightly left and right of their original positions. This can “open up” the high end of mixes that have strong low end, which can mask the highs in some recordings. Use low values of Spread to avoid diffusion and non-localization of the high end, which can harm the directionality cues of the original sources. The Factory Preset can be more effective on single-tracks; this setup is intended more for full mixes or submixes. Adjust Spread and FCenter to focus the effect.

Note for Default in XSplit -generally, the same as the Split, but provides automatic XFeed tracking for easy setup and control of strong stereo images. This setup provides spectacular stereo for general use while keeping the low frequencies generally centered. XFeed is set to 1.0, which is the maximum crossfeed level. However since this is a multiplier of the Spread value, you can have higher degrees of crossfeed by setting XFeed to 0.0, then following the Split or XSplit plug-ins with a DLA-X, which will not track the Spread setting, but will have a fixed crossfeed level (by setting XFeed in the DLA-X instead of the Split plug-in). Highly recommended is the use of the DLA-XLB in this configuration for the most flexibility in high/low cross-feeds, and bass delay compensation.