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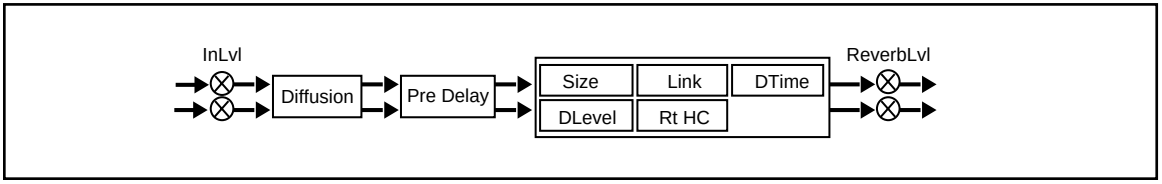
Reference

PC-90 Algorithms

Ambience



Unlike traditional reverb, Ambience is intended to become a part of the direct sound – to give it both better blend and a definite position in space. Ambience gives warmth, spaciousness and depth to a performance without coloring the direct sound at all.

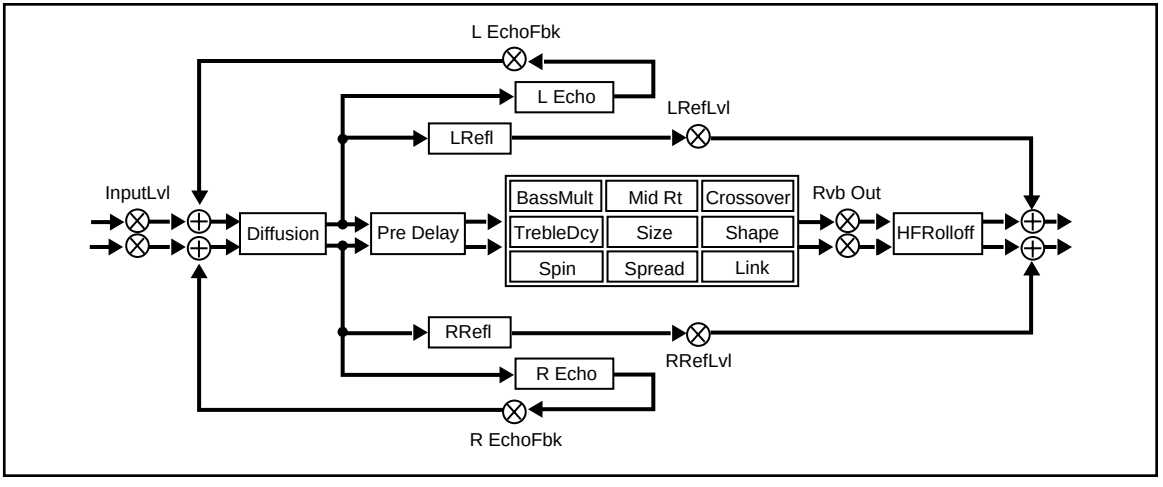
This algorithm generates primarily the strong reflections which appear in the first few hundred milliseconds of the reverberation process. These early reflections constitute the primary audible effect, giving you the impression of a hall surrounding you while the music is playing. To avoid any coloration from these strong reflections, the time delays and amplitudes are random functions.

Ambience is very useful for adding a room sound to recorded music or speech. It is particularly easy to match a studio recording of dialog to a typical room environment. In music recording, it allows you to realistically add distance to a close-miked signal. If an ensemble has been recorded with close-mikes and pan pots, Ambience can provide the missing blend and depth. The apparent position of the instruments is preserved in the reverb while the apparent distance is increased. This algorithm is also useful in matching a closely miked accent microphone to the overall ambience of a recording.

This allows a soloist to be increased in level without changing the apparent distance. Ambience can be used in a recording situation any time a close-miked sound is undesirable.

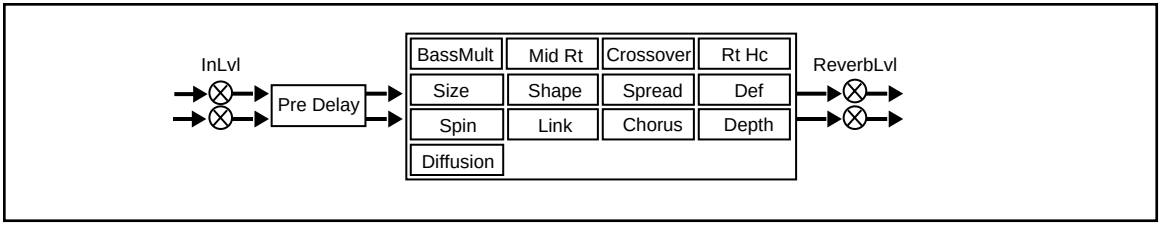
When using Ambience in a mix, it is best to use a stereo send to the PC-90, carefully matching the panning of the various close-miked sources to their positions in the mix. Leave the Mix control at 100% wet. the apparent distance of each source can be controlled by the level of its feed.

Chamber



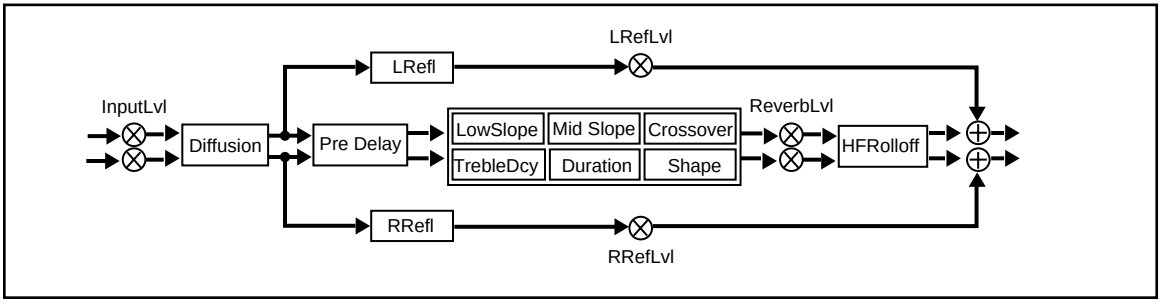
Chamber provides an even, relatively dimension-less reverberation, with little change in color as the sound decays. The initial diffusion is similar to the Concert Hall algorithm, but the sense of size and space is much less obvious. This characteristic, along with low color in the decay tail, makes Chamber useful on a wide range of program material. It is especially useful on spoken voice, giving a noticeable increase in loudness with very low color.

Concert Hall



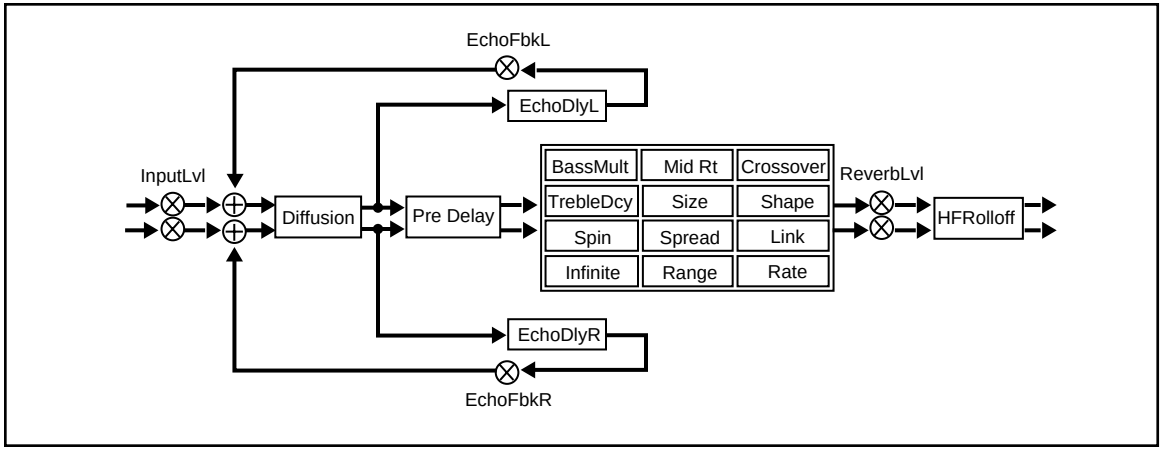
This algorithm emulates a real concert hall. The reverberation is very clean, and designed to remain behind the direct sound – adding ambience, but leaving the source unchanged. This effect has a relatively low initial echo density which builds up gradually over time.

Inverse



This algorithm allows you to vary the slope of the initial portion of the reverb envelope. The slope can decay, remain level, or rise over a variable time interval. When the time interval is up, the reverberation cuts off abruptly. The resulting effect is similar to a gate, but is not at all dependent on the level or complexity of the input signal. Slopes are adjustable over a negative, even, or positive slope. Positive slopes create inverse effects, while more even slopes create gated effects. Negative slope values have rather natural reverb tails.

Room



Room produces an excellent simulation of a very small room which is useful for dialog and voice-over applications, but which may be too colored for some sustained musical tones. Increasing the Size/Shape/Spread parameters produces an excellent reverb.

The Parameters

The PC-90 has a wide range of parameters to control the sound of your algorithms. Not all parameters are found in all algorithms.

Chorus

In the Concert Hall algorithm, Chorus randomizes delay times and introduces modulation to make reverberation sound less metallic. Increasing Chorus increases the rate of modulation. Because Chorusing can cause pitch variation, this parameter should be set with care when using sources with very little pitch wobble (such as guitar or piano). A good practice is to increase the setting until the pitch wobble becomes noticeable, then lower it slightly.

Crossover

Crossover sets the frequency at which the transition from Mid Rt to Low Rt takes place. This control should be set at least two octaves higher than the low frequency you want to boost. For example, to boost a signal at 100Hz, set Crossover to 400Hz. (This setting works well for classical music). Crossover works best around 400Hz for boosting low frequencies, and around 1.5 kHz for cutting low frequencies.

Decay

In Ambience, Decay controls the length of the ambience “tail”.

Decay Level

In Ambience, Decay Level controls the level of the ambience “tail”. When Decay Level is off, ambience consists entirely of the early reflection signal.

Definition

In the Concert Hall algorithm, Definition affects the echo density buildup rate during the latter part of the decay period. When set to Off, the rate is determined by the program material. Raising Definition through its range (1-99%) causes the sound to become choppier - the decrease in echo density creates increasingly distinct, repetitive echo trails.

Depth

In the Concert Hall algorithm, Depth sets the output amplitude envelope, changing the listener's perspective from the front to the rear of the hall.

Diffusion

A Diffusion control is provided in all algorithms. It controls the degree to which initial echo density increases over time. High settings of Diffusion result in initial build-up of echo density, and low settings cause low initial build-up. Echo density is also affected by Size; smaller spaces will sound denser. To enhance percussion, use high settings of Diffusion. For clearer, more natural vocals, mixes, and piano music, use low or moderate settings of Diffusion. Note that, at some extreme input levels, high settings of Diffusion may trigger the overload indicators on the Clip display.

Duration

In the Inverse algorithm, Duration determines the length of time, in milliseconds, which passes before the cutoff in Inverse effects.

Echo Delays

Echo Delay L and Echo Delay R provide echoes to the left and right channels. Unlike Delay and Reflect, which are isolated right and left delays, left and right echoes are blended in the diffusor. The echoes are routed both to the outputs and through a feedback path.

Echo Feedback

Fbk L and Fbk R modify the levels of the echo feedback path. The range is from -100% to 0 to +100%.

Effects Mix

Mix controls the ratio of dry and wet signal present at the PC-90 outputs. When the PC-90 is used as an effects loop, this control should always be set for 100% wet.

HF Rolloff

HF Rolloff sets the high frequency cutoff of a low-pass filter. This parameter affects both channels.

Infinite

In the Room algorithm, this control is provided to turn the Infinite effect On or Off.

Input Lvl

InLvl controls the level of the unprocessed (dry) signal into the effect.

Link

When Link is set to On, the reverb time (Mid RT) and Spread scale linearly as the Size control is varies. For some special effects, Mid RT, Spread and Size can be unlinked.

Mid Rt and Bass Mult

Mid Rt sets the reverb time for mid-frequency signals. Because low frequency reverb time (Low Rt) is a multiplier of Mid Rt, Mid Rt acts as a master control for the reverb time. Bass Mult sets the reverb time for low-frequency signals, as a multiplier of the Mid Rt parameter. For example, if Bass Mult is set to 2X, and Mid Rt is set to two seconds, the low frequency reverb time will be four seconds. For a naturally sounding hall ambience, we recommend values of 1.5X or less.

Pre Delay

Pre Delay adjusts an additional time delay between the input of signal and the onset of reverberation. This control is not intended to mimic the time delays in natural spaces. In real rooms, the build-up of reverberation is gradual, and the initial time gap is usually relatively short. Natural spaces are best emulated by adjusting Spread for the desired effective predelay.

Range and Rate

In the Room algorithm, these controls are used to reduce coloration for small room sizes or to reduce the sense of periodicity when the Infinite control is on. These controls allow you to set the range of a moving delay and the speed at which it moves. High settings of either control may be unsuitable for sustained tones, like piano.

Reverb Level

Reverb Level sets the amount of reverberation in the processed signal. It is normally FULL, but may be reduced for effects where the pre-echoes should dominate.

Reflect Delays

In the Chamber and Inverse algorithms, L Refl and R Refl provide pre-echoes to the left and right channels. In Chamber, the maximum delay value is 1.2 seconds. In Inverse, the maximum delay value is 800 milliseconds.

Reflect Levels

L RefLvl and R RefLvl control the level of the reflections (L Refl and R Refl). The range of each level is from Full (0dB) to -85dB, and to Off.

Shape, Spread

Shape and Spread work together to control the overall ambience of the reverberation. Shape determines the contour of the reverberation envelope. With Shape all the way down, reverberation builds explosively, and decays quickly. As Shape is advanced, reverberation builds up more slowly and sustains for the time set by the Spread. With Shape in the middle, the build-up and sustain of the reverberation envelope emulates a large concert hall (assuming that Spread is at least halfway up, and that Size is 30 meters or larger). Low Spread settings result in a rapid onset of reverberation at the beginning of the envelope, with little or no sustain. Higher settings spread out both the buildup and sustain.

Size

Size sets the rate of build-up of diffusion after the initial period (which is controlled by Diffusion). The Size control changes a reverb sound from very large to very small. Generally, you should set this control to approximate the size of the acoustic space you are trying to create, before adjusting anything else. The size in meters is roughly equal to the longest dimension of the space. Audio is temporarily muted when Size is changed.

Slope

In the Inverse algorithm, Slope determines the shape of the reverb envelope. When set to 0, the level of reverb remains unchanged over its duration, then cuts off abruptly (depending upon the amount of Diffusion in use). Setting Slope above 0 causes the level of reverb to rise smoothly from soft to loud until the sound is cut off. The greater the slope, the softer the initial reverberation and the more pronounced its rise. With negative values, the reverb drops from its initial level to a quieter one before cutoff. The lower the slope, the more pronounced the drop-off.

Spin

Spin affects the movement of the reverberation tail. The object of Spin is to continuously alter the timbre of the reverberant sound. This makes the result more natural, without making the position of the instruments unstable. Spin should typically be set to values between 10% and 50%. Higher values may make the timbre of piano, guitar and other precisely pitched instruments unstable.

Treble Dcy

Treble Dcy sets the frequency above which a 6dB/octave low-pass filter attenuates the reverberated signal. It does not attenuate Reflection Delays. High frequencies are often rolled off with this parameter, resulting in more natural-sounding reverberation. Setting a low frequency for this parameter can actually shorten the reverb time, as it damps the audio as it recirculates.

Notes on Preset Design

PC-90 incorporates the results of a great deal of research into acoustics and reverberation. Reverberation, or reflected sound energy, gives recorded music a sense of being performed in a real acoustic location.

Using the Size and Spread Parameters

In the PC-90, the Size and Spread controls allow adjustment of the buildup and decay of the initial part of the reverberation envelope. In the Chamber algorithm, Size acts as a master control for the apparent size of the space being created by PC-90. Both Spread and Mid Rt vary linearly with the setting of Size. Thus, maximum reverb time and spread may require high settings of Size. To find an appropriate reverb sound, start with a preset with a similar sound to what you want to end up with. Simply varying Size is often sufficient to arrive at the exact sound you are seeking.

Once a size has been selected, Spread and Shape are used to adjust the shape and duration of the initial reverb envelope, which together provide the major sonic impression of room size. The density is set by the size control, and the rate of decay is set by Mid Rt.

As Shape is raised to about 1/8 of its range, the initial sharp attack of the reverberation is reduced, and reverberation builds more slowly. The envelope then sustains briefly before it begins to die away at the rate set by Mid Rt. Spread has little or no effect on this shape.

When Shape is at 1/4 of its range, buildup is even slower and the sustain is longer. Now Spread affects the length of both the buildup and sustain. As a rough estimate, the sustain will be approximately the time value indicated by the Spread display (in milliseconds).

As Shape is raised further, the buildup and sustain remain similar, but now a secondary sustain appears in the envelope, at a lower level than the first. This secondary plateau simulates a very diffused reflection off the back wall of a hall, and is effective in creating a sense of size and space. This reflection becomes stronger and stronger, reaching an optimal loudness when Shape is at about 1/2 of its range.

The highest Shape settings are typically used for effects. Near the top of the scale the back wall reflection becomes stronger than the earlier part of the envelope, resulting in an inverse sound.

NOTE: None of these effects are audible unless Mid Rt is set short enough. Generally, Mid Rt should be set to a value of about 1.2 seconds for small rooms, and up to 2.4 seconds or so for “halls”. Size should also be set to a value appropriate to the desired hall size (note, however, that small sizes color the reverberation). 15 meters makes a very small room, and 38 meters is useful for a large hall.

Used with care, Shape and Spread allow PC-90 to produce superior ambience – a sound which is spacious and has great depth – without the long reverberation of a church.

Random Delay Elements

PC-90 incorporates random delay elements in its reverb. These elements have several effects. First, there is a reduction of long-lived modes in the reverberant decay, which makes the decay less metallic and reduces the apparent reverb time. The random elements also improve the steady-state timbre of the effect.

The speed at which the delay elements move is controlled by Spin. Settings higher than about 40-40% can cause audible pitch wobble in very critical material such as classical guitar or piano and can also cause noise on pure tones. This noise is not audible in speech, however, and, for mixed music or speech, values up to 48% can give an improved sound.

Creating a Realistic Sound

When you set out to create a sound, the first and most important decision is how big a space you want. The best way to start is to listen to several presets and choose the one which sounds closest to what you have in mind. If necessary, use Size to make a slightly larger or smaller sound, as needed.

Next use Mid Rt to fine-tune the amount of time the reverberation takes to die away at the end of musical phrases. Actual halls vary a great deal in their Mid Rt values. The setting of Bass Mult is also critical in matching the sound of an existing hall. An ideal concert hall would have a Bass Mult setting of 1.2. It is rare when actual physical spaces exceed 1.5. many (if not most) good recording environments have values of 1.0 or less, so a value of 0.8 could be tried when attempting to match an existing hall.

Spread also adjusts the effective reverb time when the music is running. Higher values of Spread produce a longer effective reverb time, which, in turn, gives greater spaciousness to the sound.