

Elliott Sound Products

Project 21

## Stereo Width Controllers

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### Introduction

Sometimes, for a variety of reasons, it would be nice to vary the width of the 'sound stage' when listening to stereo recordings. Although technically this is anything but hi-fi, it is a useful addition to PC speakers, or even for the music centre in the listening room.

Why? Because a lot of CDs (some genres of rock music in particular) are recorded with an exaggerated stereo image, while other music may be lacking in width. This may also happen if your speakers are too close together (or too far apart). Width controllers used to be quite popular with listeners wearing headphones, because the normal image is too wide when each reproducer is playing directly into its respective ear.

The idea for stereo width control is not new, and the circuits reproduced here are adaptations from a number of sources.

There are two different versions of the width controller principle shown. They are somewhat similar in terms of what they do, but go about it in different ways. The first is the simpler of the two, and is shown in Figure 1. This unit will be found quite effective, but it is too imprecise to use the potentiometer to return to a normal stereo image. For this reason, the switch is essential - when in the open state, the circuit does nothing at all.

The second version does not need the switch, because when the pot is in the centre position, the circuit's skulduggery is defeated, and normal stereo is passed through without modification. For many, this add-on circuit may only be used rarely, and bypass switching circuitry is also shown.

### Stereo Width Controller - Version 1

This unit is very simple to make, and is also cheap. No dual-ganged pot is needed, and the opamps all operate with low gain so will contribute very little noise. This version is particularly simple, using only 2 dual opamps (or one quad).

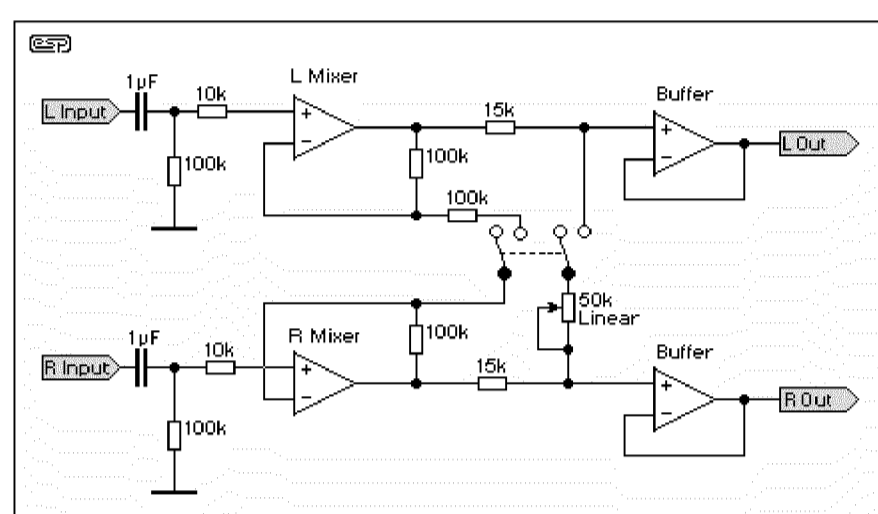


Figure 1 - Simple Stereo Width Controller

The range of this unit is from mono (when the pot is set to minimum resistance), through varying stages of reduced width until the pot is approximately 1/2 way. At this point, the stereo image is normal (allowing for some variation). As the resistance of the pot is increased further, the image widens, as "negative crosstalk" is introduced. This is created by the Left and Right mixing amps and is present all the time. The pot in the centre position cancels out the negative crosstalk with positive crosstalk, resulting in normal stereo.

The effect of the negative crosstalk is to make the speakers sound as if they are further apart than they actually are - a little bit like wiring the speakers out of phase, but without the (often dramatic) loss of bass.

The switch will disable the L and R mixer stages, converting them to simple non-inverting buffers, and also disconnects the pot. This would otherwise create crosstalk, ruining the normal stereo effect. The output buffers are to prevent external circuitry from loading the mixing circuit, which will change its characteristics.

Although not shown, make sure that you use 100 Ohm resistors in series with each output to prevent the opamps from oscillating when a lead is connected.

### Stereo Width Controller - De-Luxe Version (?)

The next unit shown is far more linear and gives a wider sound stage than the simple version shown above. At one extreme (with the 10k dual-gang pot wiper at the top - as you look at the diagram), the signal is mono. At the other extreme, the signal is subject to 100% negative crosstalk, so the sound is 'spilt' into two separate sound sources, with no centre image at all. When in the centre, the stereo image is unaffected, and there is no enhancement at all.

Generally, a setting somewhere between 'normal' and one or the other extreme will be used, depending upon the listener's preference, and the speaker placement.

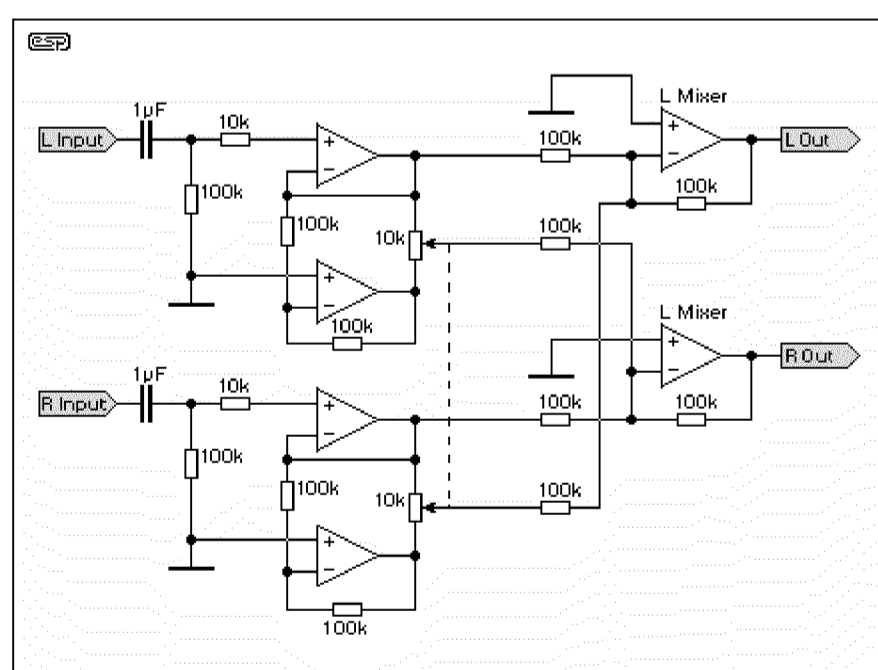


Figure 2 - Stereo Width Controller - Version 2

This circuit is actually only marginally more complex than the first, but as stated before is more linear and provides a wider control range. The input stages are simply a standard non-inverting buffer and an inverting buffer - one set for each channel. The signal voltage at the centre of the 10k pots is zero, since it is the sum of equal and opposite signals.

The output mixers are supplied with a non-inverted signal from the appropriate channel, and a variable (via the pot) amount of in-phase - or anti-phase - signal from the other channel. When the pot is all the way to the top, the output of each mixer is the sum of the Left and Right channels - i.e. mono. At the other extreme, the output of each channel is devoid of all centre channel information (a bit like a karaoke mixer), with effectively two separate sound sources.

If this device were to be coupled with the simple surround-sound decoder (See Project 18), this would add considerably to the effect. The surround-sound decoder must be connected first, or it will not be possible to extract the centre sound because the width controller will have 'stolen' most of it.

As with the previous circuit, use 100 ohm resistors in each output to prevent opamp oscillation.

### Switching Out The Width Controller

Although both circuits presented can be set to provide normal stereo, for hi-fi we really want to keep only the circuitry that is really needed to avoid degradation. The switching arrangement shown in Figure 3 will do just that. When switched out of circuit, only the inputs remain connected - this will cause no increase in noise or distortion whatsoever.

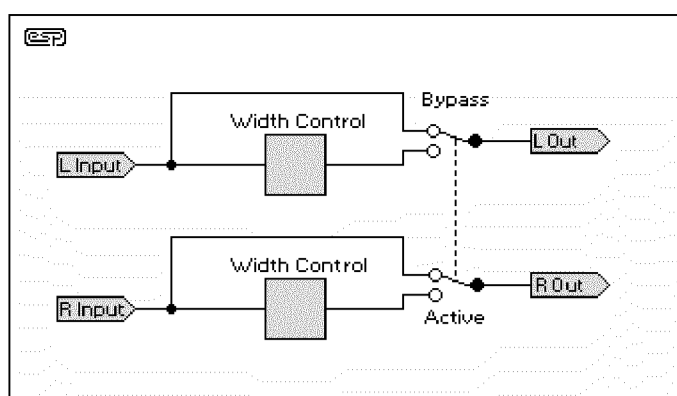



Figure 3 - Switching to Bypass the Width Controllers

This arrangement will work equally well with both circuits, and is fairly self explanatory. In the bypass position, the input signal is fed directly to the outputs, bypassing the width control entirely.

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