DANGEROUS MUSIC S&M

If your stereo mixes are too narrow, too airless, too dry or impossibly dynamic, fixing these problems might be a simple case of getting involved in a bit of S&M.

Text: Andy Stewart

I dunno whether it’s because the company hails from New York or simply because its owner and designer are involved in gang-related violence on the weekends, but either way, Dangerous Music’s reputation precedes it. At last year’s AES conference, however, it quickly became abundantly clear that the men behind Dangerous Music aren’t tough at all, in fact, they’re pussies!

Dangerous Music (who are actually a great bunch of guys) have released several interesting pro audio devices in recent years (none of them remotely dangerous) including some classy monitoring options for mixing and mastering, analogue summing boxes and even a metering/headphone unit – that seems like the perfect solution for Stav and his missing VU meters. But what caught my attention recently, as I browsed the Dangerous Music website while mastering at Turlerock, was an intriguing (and simple) device that is arguably one of the most humble (and least threatening) units in the ‘Dangerous’ stable.

The device is the Dangerous S&M, which for some reason I keep calling the ‘widener’. It’s certainly the simplest looking unit in the company’s catalogue, and as I discovered while interviewing its well known designer, Chris Muth, it’s also one of the oldest – it was actually first developed by Chris with Australian ex-pat mastering engineer Leon Zervos while the two of them were at Absolute Audio together in around 1995. The S&M matrix was based on the ‘width control’ circuit found inside Leon’s original EMI cutting console in Sydney.

And like the EMI circuit (which also has only one control) it’s what lies behind the minimal façade of the S&M that matters most. The front panel may indeed be bereft of bells and whistles, but this barren interface conceals a power of manipulation over stereo image that I feared was almost forgotten in the 21st century.

So what is the S&M, what does it do and why does it only have one knob? And what’s more, how can an analogue device with a solitary stepped attenuator (albeit a costly one) possibly be of any use to anyone in this complex digital age? Well, I guess to appreciate what this unit does and why it’s in fact a powerhouse of stereo manipulation and control, we have to (unfortunately) dive straight in and get some grounding in the relatively simple mathematics that underpins it. Apologies in advance if I start sounding like a didactic twerp from this point on… hopefully I’ll avoid that.

DIFFERENCES SHARED IN COMMON

The Dangerous Music S&M is primarily a hardware analogue device that separates everything that’s ‘common’ in a stereo image (the mono information) from everything that’s ‘different’ in a stereo image (the stereo information). The S&M performs this task by utilising an electronic matrix, the principles of which were first invented by Alan Dower Blumlein in the early 1930s [see the box item for more on the man himself].

This matrix, although relatively simple, is designed with very narrow electronic tolerances to ensure that the fragile stereo image survives the ‘disintegrating’ and ‘reintegrating’ process, as I like to imagine it. It’s actually not too dissimilar to the famous Daffy Duck cartoon, Daffy Dodgers in 24th & a Half Century, where Daffy regularly steps into a ‘disintegrating capsule’ and teleports himself across the city, where a ‘reintegrating capsule’ puts him back together. The S&M matrix does a similar thing to a stereo image, and a good one like the Dangerous S&M takes great care to ensure that the phase integrity of the signal is retained throughout the matrix, otherwise the stereo image comes back sounding like a dog’s breakfast. It’s all about phase integrity in the end, not bells and whistles or the colour of the unit’s anodised faceplate – a fact that Chris Muth thankfully knows all too well.

THE POWER OF ONE… NOB

A Sum & Difference matrix is one of the most powerful, simplest and yet commonly misunderstood concepts in stereo. So let’s try and understand the concept once and for all, because without some grounding in the mathematics there’s not much point reviewing this box. Then, once we’ve got a better grasp of the underlying principles, a whole world of stereo image manipulation will open up that you perhaps never dreamed possible.

Probably the most critical fact to keep in mind when trying to understand how a Sum & Difference matrix works, is to remember that we are only ever dealing with two strands of audio information: initially in the standard audio format of Left and Right. Left has information that’s unique to itself and also information that it shares in common with its companion, the Right channel. Right has information that’s unique to itself and also information that it shares in common with the Left channel. It’s when these two signals are played back together that we get stereo, which is (plainly) made up of two channels of information that combine to form a phantom centre (or false mono, as some call it). Now I know this might seem like the most obvious statement ever printed in the pages of AT, but it’s important to state here and now, because from this point on most people get horribly lost, and develop that tell-tale vacant stare that says: “I hear what you’re saying, but I haven’t got a clue what you’re talking about!”
WHAT IS THE MATRIX?

Where the understanding of this process suddenly falls in a screaming heap for most people is when these two channels are placed into a Sum & Difference matrix to create again, two channels of audio information: Sum (which is made up – as the name suggests – of a straight summing of the left and right channels) and Difference (which is a summation of Left and a polarity-inverted (and hence subtractive) Right channel, which creates an audio channel comprised of everything that's sonically different about the two channels). Now this shouldn't start people's eyes glazing over just yet; a Sum & Difference matrix doesn't involve post-graduate pure mathematics; it's elementary... so hang in there. The maths we've covered thus far is simply this: Left + Right = Sum (L+R=S), and Left – Right = Difference (L–R=D).

The matrix performs this feat by simply creating two left and right channels (internally); one stereo pair is then used to create our Sum (L+R) while the other pair (L–R) creates our Difference. Once this internal process has occurred we now still only have two channels of audio, but now they scarcely resemble the stereo image that created them.

What's cool about this newly created audio amalgam is that we can now manipulate it in ways that are impossible in L/R stereo. For instance, we can now send the Sum (common) information to, let's say, one channel of EQ and in L/R stereo. For instance, we can now send the Sum that we can now manipulate it in ways that are impossible to create our Sum (L+R) while the other pair (L–R) creates our Difference. Once this internal process has occurred we now still only have two channels of audio, but now they scarcely resemble the stereo image that created them.

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top-end into some dull electric guitars that were panned hard left and right in our original stereo image. With a normal stereo signal, performing these two seemingly paradoxical tasks simultaneously would prove both time-consuming and largely futile. De-essing the central main vocal will only tend to make our already dull guitars even duller, and conversely, brightening the top end of our guitars will almost certainly exacerbate our already over-the-top ‘ess’s. But with the signal split into Sum & Difference it's a doddle… Limit the Sum channel with a compressor to control the ‘ess’ and EQ the Difference channel to bring out the clarity in the guitars. It’s a miracle… quick, someone call the Vatican!

So as you can see, separating Sum & Difference with a quality unit like the Dangerous S&M can open up your imagination to a whole world of manipulation: you can widen a stereo drum overhead during mixdown so there’s massive amounts of room and width in the image without the central snare and kick drum information knocking a hole in your head, de-ess a vocal in the middle of a stereo image without punching holes in the entire mix, cure thin and feeble hard-panned electric guitars by adding low-midrange frequencies to the difference channel without also adding it to your central kick drum which already has plenty… and so on and so forth… the scenarios are virtually endless.

SUM OF THE PARTS

But hang on, ‘how the hell do we fold our Sum & Difference information back into stereo?’, I hear you ask. Well, thankfully the S&M matrix also does that for you by simply now adding our ‘Sum’ information (that was an amalgam of Left plus Right) to our ‘Difference’ information.
(that was derived from Left and a polarity inverted Right) to give us back our Left channel, while simultaneously subtracting Sum from Difference to give us back the Right channel. Mathematically this process looks something like this: Sum + Difference = Left Restored (S+D=LR), and Sum – Difference = Right Restored (S–D=RR).

After explaining all that maths I don't know who's feeling worse, me or you... but I'm hoping that at least some of you will now understand that a Sum & Difference matrix doesn't somehow leave you with three channels of audio or require three channels of EQ and compression to adjust your gain, dynamic or tone. There are only ever two channels to manipulate. And of course, with the Dangerous S&M box, you're never actually hearing the audio in Sum & Difference as such; by that I mean, it's not as if all your Sum information is suddenly paled into the left speaker and Difference into the right. It still presents as a normal stereo image, it's only the control over the signal that changes. This is why so many people are tricked into thinking there are somehow three channels of audio, because to all intents and purposes it feels like there are now Left, Centre and Right controls... but this is a false impression!

MORE FACTS ABOUT S&M

For anyone left standing who's still interested in a few more facts about the Dangerous S&M, I'll try and be mercifully brief. The S&M is certainly one of the most gifted proponents of this stereo trickery I know of. It's simple, elegant and successfully rebuilds Left and Right from Sum and Difference without the signal developing phase anomalies. Of course, inserting massive quantities of EQ and compression into the matrix may cause your mixes to start sounding a little 'quirily', but in subtle well-crafted amounts, they will shine. In multitrack mixdown, however, the S&M can be used more radically to achieve outrageously wide sounds, given that in that situation, you're not having to consider all the other sounds embedded in the signal.

The S&M unit has two controls: a simple illuminated switch and a precise stepped attenuator that controls the 'width' of your stereo image in smooth, noiseless 0.5dB increments ranging from –4 to +6dB. With the switch 'out' the unit's matrix is bypassed and the rear-panel insert XLRs feed outboard equipment normal L/R stereo information. With the switch 'in' the unit's matrix is activated and the inserts now feed Sum & Difference information to whatever equipment is placed in the chain, be it compressors, limiters or EQs. Either way, the unit requires the insert 'loop' on the back panel to be completed, either via external compressors and the like, or with patch leads that connect the send XLRs directly to the returns. Without these leads connected you'll get nothing!

I'll wrap this all up now by simply saying that the Dangerous S&M is a high-quality facilitator of analogue Sum & Difference for anyone interested in performing this acrobatic feat to left and right stereo information. A parting word of warning should also be issued to anyone stepping into this fascinating world for the first time: a little S&M goes a long way and great care must be taken not to overcook your width. This is why the width control on the Dangerous S&M only offers a seemingly stingy 6dB of gain. Initially it will seem like you can't get enough of this spectacular new enhancement (and of course, if you really need more you can just boost the makeup gain on your Difference channel’s compressor or EQ, for some extra level), but later you’ll probably realise that you took it all too far. So whack on some headphones and let them be your guide... once you become skilled in this technique, the stereo world will become your oyster.

Price
$2799
Contact
ATT Audio Controls
(03) 9379 1511
info@attaudiocontrols.com
www.attaudiocontrols.com
Pros
Great phase coherence within the S&M matrix.
High quality stepped attenuator.
A great modern analogue rendition of an old (and almost forgotten) stereo tool.
Cons
Having to connect insert leads for the box to pass signal feels a little odd.
Summary
The ability to derive Sum & Difference from stereo audio is almost a must-have process for anyone serious about manipulating stereo audio... having said that, very few people are abreast of what this type of device does, and even fewer people own one. Do yourself a favour, though, and check it out because the S&M is a wolf in sheep's clothing - powerful, subtle and worth its weight in Neutrik connectors.