

Royer SF12 Stereo Ribbon Microphone Greg Simmons files his report on this unique microphone, and discusses some basic principles of stereo along the way.

In the mid '80s I spent some time working for the talented Australian producer/engineer and former LRB guitarist, David Briggs. Apart from teaching me numerous 'top secret' production tricks learnt from his recording experiences in the USA, Briggs also introduced me to a fantastic book called 'Practical Techniques For The Recording Engineer' (ISBN 0-942080-00-9) by Sherman Keene. This self-published book was one of the most useful texts I'd ever seen on the topic of sound engineering, and it became our studio bible. Whenever a situation arose that we weren't sure how to deal with, Briggs would ask, "What does Sherman say?".

I'll bet most of you have never heard of Sherman Keene. Usually credited as Barry Keene, he engineered a number of great recordings for artists including The Byrds, Ike and Tina Turner, and Frank Zappa (one of the most demanding perfectionist artists of all time). Sherman Keene was a true recording professional, and I hung on his every word as if it were the gospel. One of the most useful pieces of advice I got from his book was also one of the simplest: "A good mix includes at least one true stereo track". That advice has served me well to this day. [For the latest information on Sherman Keene and his books, go <http://www.theriver.com/shermankeene/>]

But let's think about 'true stereo' for a moment. How many readers really understand the concept? In an age where multiple channel surround sound systems are being foisted upon an eager market, I am alarmed to find that many people still don't understand the true requirements for two channel stereo and therefore have never experienced it properly. If we can't get two channels right, what sort of mess are we going to make with five or more?

The word 'stereo', in an audio context, is a contraction of the word 'stereophonics'. In 'The New Stereo Soundbook' (ISBN 0-9665162-0-6), authors Ron Streicher and F. Alton Everest write: "The word 'stereophonics' was derived by combining two Greek words: 'stereo', which means solid and implicates the three spatial dimensions (depth, breadth, and height), and 'phonics', which means the science of sound. Thus, 'stereophonics' denotes the science of three-

dimensional sound."

Although this definition does not specify how many channels are required, the basic principle of stereo sound as we know it is to have two separate channels of recorded sound reproduced through two separate loudspeakers, which are generally positioned to form an equilateral triangle with the listener. In this situation, with good quality loudspeakers, reasonable acoustics and symmetrical room placement, it is not difficult to create an impressive three-dimensional sound field. But you won't get there without a true stereo recording, which brings me to the Royer SF12 stereo ribbon microphone.

The SF12 contains two carefully matched pure aluminium ribbon elements, each 1.8 microns thick and 0.33 milligrams in weight. Being ribbon elements, they naturally have a bidirectional (figure-of-eight) polar pattern with virtually no off-axis colouration - a very important consideration for natural sounding stereo recording. The two elements are placed in a coincident pair: one precisely aligned above the other, with a 90° angle between their axes. This arrangement forms the classic 'Blumlein' stereo miking technique, invented by Alan Dower Blumlein and revered by audiophile recording engineers for its excellent stereo imaging (see 'The Blumlein Technique' for further information).

While the Blumlein technique can deliver impressive results, setting it up to work correctly with two mono microphones is time consuming because precise alignment of the two capsules is critical for proper performance. This is where a stereo microphone such as the SF12 has a great advantage - its two ribbon elements are always perfectly aligned with respect to each other, so its location can be changed quickly and easily without altering the relationship between the capsules.

Review package

The complete SF12 review package included two special purpose stereo leads, a standard microphone clip, an informative owner's manual, and an attractively finished wooden box which houses the microphone itself. An AudioTechnica AT-84 shock mount (which Royer supplies and recommends) was also supplied, although this is sold as an optional extra.

A five pin male XLR on the bottom of the microphone provides the stereo output, and a short Y lead splits the left and right signals into standard three pin male XLRs. A 5.5m lead, fitted with a five pin XLR on each end, serves as a convenient stereo extension lead and eliminates the need to run separate left and right leads down the mic stand. These leads use Canare and Mogami cable, and Switchcraft XLRs - all respectable brands.

The SF12 is long and slender, but relatively heavy due to its ingot iron construction. The build

quality is good and solid, and the slim shape contrasts with the retro slots, creating a look that could have come from any time in the history of recording.

In use

I've had the luxury of using the SF12 for over a year now (much to the frustration of Royer Labs, Australian Audio Supplies, and the production team at AudioTechnology!), and feel rightly qualified to discuss its sound and applications. I've used it as the sole microphone on some interesting projects, from concert harps and string quartets to Gaelic vocal trios and Buddhist monks. It has never disappointed me. All of these projects were recorded directly to stereo with no EQ or effects, and, after editing, some have gone on to mass CD replication with no additional processing or mastering. In my opinion, that's a sign of a great stereo microphone.

But as with any microphone, the SF12 does not hand this direct-to-CD quality to you on a plate. You have to learn how ribbons work, and you have to understand the Blumlein polar pattern and how it 'sees' the space surrounding it. The SF12 doesn't like reflections from nearby walls (and other large reflective surfaces) which arrive in the vicinity of the 90° or 270° points on the stereo polar pattern. These reflections confuse the stereo image and muddle the wonderful sense of depth and space the SF12 is capable of delivering. In situations where side wall reflections were unavoidable, I found strategically placed absorption and/or diffusion was helpful.

Finally, as with all ribbon microphones, the output tends to be lower than most condenser microphones. So, if you plan on using the SF12 at a distance from the sound source, use preamps that can provide plenty of gain without too much noise. Unlike condensers, ribbons have no active electronics and therefore produce virtually no electrical noise of their own - so a low noise preamp will give you a low noise recording. For a distant miked recording of a seven piece string section in a church hall, I used the SF12 with a pair of AMEK PurePath mic preamps, each providing a whopping 60dB of virtually silent gain! A good combination in terms of noise and dynamic range, although perhaps a little neutral in tone for some tastes.

How does it sound?

In volume one, issue six of AudioTechnology, Trevor Cronin briefly reviewed Royer's R-121 mono ribbon microphone, commenting on its "pleasantly warm ambient sound with a very flat frequency response regardless of the distance from the sound source". The same can be said of the SF12, although I am cautious of using the word 'warm' without defining it properly. Not because the SF12 isn't warm, but because the word 'warm' seems to have become reserved exclusively for describing tube circuitry.

The SF12 does not have the thermionic warmth associated with affordable tube circuits, where the manufacturer often exaggerates the effect to create a soft and fuzzy kind of warmth. Rather, it's the hysteresis warmth associated with analog magnetic tape and transformers, where the words 'solid' and 'healthy' come to mind in place of 'soft' and 'fuzzy'. But don't get me wrong, there is nothing exaggerated about the SF12's sound. It is the most pure and organic mic I've ever heard. So don't think of added warmth, think instead of subtracted coldness! (Take away the coldness and all that's left is the warmth, right?)

Also, the SF12 has a particularly smooth high frequency response which makes the common studio condensers sound overly bright or etched in comparison. It excels on metallic sounds such as cymbals and brass instruments. This quality was ultimately brought to my attention while recording a Buddhist monk striking a tiny metal bell. The recorded tone remains surprisingly delicate and pure, metallic without being harsh, and not at all what I was expecting to hear. Spooky... Furthermore, the SF12's high frequency smoothness allows considerable amounts of EQ to be added without becoming harsh or fatiguing.

All these sonic qualities, combined with a lack of any significant off-axis colouration and the Blumlein configuration, delivers the best stereo imaging I've heard from any miking system. The SF12's reproduction of width and depth is exceptionally accurate. Very small changes in a sound's position are readily discernible, as are small changes in the mic's position.

Room for improvement?

After all that relentlessly positive talk, I'm sure the above heading has caught your attention. Let me state that I have no quips whatsoever with the SF12 itself. However, I'd like to see a better shock mount: the supplied AT-84 seems nervously unbalanced and top heavy when holding the SF12, and requires fiddling with the elastic suspension to keep things stable. Not very confidence-inspiring! A mic of the SF12's calibre deserves its own custom shock mount.

Also, I'm concerned over the use of Canare Star Quad cable for the 5.5m long stereo extension lead. The Star Quad configuration is designed as a low noise cable for mono microphone signals, and in that application it works very well. It uses five internal conductors, which would be ideal for a stereo mic signal except they are not shielded from each other. In fact, they are twisted together, which actually encourages interchannel crosstalk - the natural enemy of stereo imaging and depth! I have not made any measurements nor have I done any listening tests, so this may be a totally unfounded concern. However, I'd feel a lot more comfortable seeing a

proper stereo cable used for this application. Call me fickle if you like, but I think the SF12 deserves a true stereo extension lead. It certainly wouldn't do any harm...

Is it for you?

So why buy a stereo ribbon microphone? Doesn't it have very limited applications? On the contrary, it has as many applications as a mono ribbon microphone, and more... Apart from making excellent stereo recordings, don't forget that you can always choose to use only the left or right output of this microphone, or to use both sides summed to mono if that's what you need. Because the elements are a precisely aligned coincident pair, you'll get no mono compatibility problems.

Apart from being able to use it as a mono mic, you might also consider using it in preference to a collection of mono mics. For example, miking a group of vocalists doing harmonies. Rather than putting a single mic in front of each vocalist and trying to balance them with the mixing console, consider positioning them around a single stereo microphone such as the SF12. With careful positioning with regard to the Blumlein polar response, and a bit of coaching of each individual vocalist, the results can be much more impressive. (This reminds me of another piece of useful Sherman Keen advice: "The best mixer of multiple sounds is air; no console can mix sounds as well as air can.")

I've also had surprisingly good results using the SF12 to record a singer/guitarist as two mono tracks. Using a bit of literal lateral thinking (think about it), I gave the AT-84 shock mount a hernia by positioning the SF12 sideways and locating it so that one ribbon element picked up the guitar while rejecting some of voice, and the other element picked up the voice while rejecting some of the guitar. After a bit of experimenting with position, I was able to get a good clean recording of a live performance, without the comb filtering problems associated with using two separate mics spaced apart. The result had the clarity and solidity of a single mono microphone, but gave me reasonable separation for subtly EQing and processing the vocals separately from the guitar. And by panning the two tracks slightly left and right, I got a sense of the performer's movement without the flanging effect that commonly occurs when using two spaced microphones on a moving sound source. Cool, huh?

Conclusion

Okay, let's get real. For the price of the SF12, you could buy an awful lot of cheap digital recording and processing gear. You could also buy some mic modelling software to imitate any microphone you can dream of. But in my experience, when you buy an awful lot of cheap digital

gear, 'awful' remains the operative word long after the digital gear has slipped off the curve of planned obsolescence and plunged into obscurity. How boring...

On the other hand, good microphones, good speakers and good headphones are always exciting and worthwhile investments. These are the areas where the real engineering challenges lie - the electromechanical devices that convert between acoustic and electrical energy. The microphone is particularly important because it defines the sound you begin with - if it's no good, then no amount of electrictrickery or digital signal processing will make it any better.

You can dream about your latest software, your 'never-enough-power' DSPs and your cool plug-ins all you like, but remember that all you'll ever be is a dreamer, strutting that digital treadmill and waiting for the next update to deliver sonic nirvana - just like the earlier versions promised. Digital gear comes and goes. It keeps getting cheaper, it keeps getting better, and it keeps being the single most foolish thing to invest large amounts of money in. But a good microphone will always be a good microphone, and won't drop in value overnight. So don't waste your money on the latest hi-tech DSP which, despite having zillion point mathematical accuracy, still sounds like it can't get the numbers right. Put your money towards a good microphone and rest assured you've got that part of the equation solved.

If you make an effort to understand the SF12, to understand the nature of ribbon microphones and the theory behind the Blumlein technique, you will be adding a touch of something very special to your recordings: true and natural stereo, with the added benefit of genuine ribbon smoothness and body. It's an analog thing. You won't get it from any DSP, plug-in or mic modelling software; not now, and not ever. But it will survive and shine through any decent digital recording and processing. That's why I bought this microphone.

Box item:

The Blumlein Technique

The history of stereo recording and reproduction can be traced to Alan Dower Blumlein, a British radar engineer who died at the age of 39 yet held almost 130 patents for numerous inventions - including the techniques that led to the development of stereo as we know it today. In his patent 'Improvements In And Relating To Sound-Transmission, Sound-Recording And Sound-Reproducing Systems' (British Patent #394,325, December 14th, 1931), Blumlein details circuits and designs for many aspects of stereo recording and reproduction, including two of the most famous coincident stereo microphone techniques - Mid/Side (or M/S) and the one that now bears his name, 'Blumlein' (sometimes referred to as 'Stereosonic'). To understand how the Blumlein technique works, we must first take a look at the bidirectional polar pattern.

Figure One shows the polar response of a bidirectional microphone. Sounds arriving from the front and rear are captured with equal sensitivity, although sounds arriving from the rear will be reproduced in reverse polarity. Sounds arriving from 90° or 270° are rejected because they are received equally well on both sides of the microphone and, because the rear side is reverse polarity, they therefore cancel out.

Figure Two shows the combined stereo polar pattern of two bidirectional microphones configured in a Blumlein pair. There are four quadrants: front, right, rear and left. Each quadrant provides information for both channels. Sounds arriving in the front quadrant are reproduced in their correct polarity and stereo position. Sounds arriving from the right quadrant are reproduced in correct polarity through the right channel, but reverse polarity through the left channel (the opposite applies to sounds arriving in the left quadrant). Sounds arriving in the rear quadrant will be reproduced in reverse polarity and in opposite channels. For example, sounds originating from the rear right side will be captured by the rear of the left facing capsule, and therefore will be reproduced through the left channel, and vice versa.

Advantages of the Blumlein bidirectional pair are crisp and accurate imaging with an almost holographic soundstage, and a natural blend of ambient sound from the rear. There are some caveats, however. Firstly, because the Blumlein pair has a 360° polar pattern, the room you record in plays a very large part in the sound you get. If the room sounds bad, you will probably get a bad sounding recording. Secondly, in most applications the goal is to position the entire sound source within the 90° 'window' of the front quadrant. As the sound source gets larger (e.g. an orchestra), the Blumlein pair has to be moved further away to maintain this relationship. But moving too far from the sound source may produce an excessively reverberant and 'roomy' sound.

Many high fidelity audiophile recording engineers prefer this method over all others for its unrivalled stereo imaging and theoretical 'correctness'. Listening to a well-engineered Blumlein recording through a high quality stereo system is quite a remarkable experience, and may leave you wondering why we need surround sound at all!

The SF12 is a great example of true Blumlein stereo. And for the purists out there, it is worth noting that the bidirectional microphones referred to in Blumlein's patent were, of course, ribbons!

Box item:

The MS Technique

It is also possible to use the SF12 in a variation of the MS technique (also developed by Alan

Dower Blumlein), replacing the centre cardioid capsule with a bidirectional capsule. When this configuration is processed with MS decoding, the resulting stereo polar pattern is Blumlein stereo, but with control over width and depth (see Figure Three). While I find the theory behind the MS technique quite fascinating and a lot of fun to implement (as do most engineers), I've never been particularly impressed with the results beyond the usual "gee whiz, I can change the depth and width in post-production" aspect of it. I've had no need or desire to use the technique in the time I've had the SF12, and so will refrain from commenting on it any further. But it's worth remembering that, should the need for MS arise, the SF12 can deliver the goods.

Box item:

A Funny Thing Happened On The Way To Australia

When I first auditioned the SF12, I was somewhat disappointed. I used it to record a vocal trio singing Gaelic folk songs in a church hall. Nice smooth sound, with a subtle dark tone which complemented the haunting nature of the songs. But I was surprised to find that there was no stereo image, when there should have been.

So I did a quick test by recording myself walking 360° around the mic. The result? It sounded like a single bidirectional microphone. I soon discovered that the five pin stereo extension lead had somehow been wired incorrectly. The reverse polarity legs of the left and right balanced outputs were swapped around, causing the whole system to behave as one large, dull, bidirectional microphone. I repaired the lead and got proper stereo behaviour, but was then dismayed to find that the right element's output was considerably lower and duller than the left.

On the advice of Australian Audio Supplies, I emailed Royer's tech support and described the situation. I got an answer almost immediately. At some point, the SF12 must have been plugged into a pair of mic inputs, one of which had phantom power turned on. Normally this won't damage an SF12, but, due to the faulty lead wiring, the right side took a burst of 48 volts across the ribbon element and was consequently damaged. The Royer folk were quite distressed about this, and promptly couriered a complete replacement package for the review. A couple of days later I was up and going with a fully functioning SF12. Stereo imaging was excellent, and the darkness was replaced by an impressively natural tonality. I bought it immediately.

Unfortunately, many Australian engineers evaluated the faulty SF12 before I received it. So, if you tried the SF12 in the past and concluded that it sounded dark and had poor stereo imaging, you probably heard the damaged mic. Contact Australian Audio Supplies to arrange another audition.