

FUNKY RIBBON

Royer R121 Studio Ribbon Microphone

Reviews : Microphone

For many, the ribbon microphone starts and ends with the BBC-designed 4038, but technology has moved on since this classic first appeared, as HughRobjohns discovers when he encounters a new state-of-the-art model from Royer.

Way back when the professional audio industry was in its infancy, ribbon microphones were extremely popular, being capable of far better results than the moving-coil microphones of the day. Development of ribbon mics reached its peak in the late 1940s and early 1950s, until they were overtaken in the quality stakes by burgeoning capacitor microphone technology.

The ribbon microphone has a lot going for it at a conceptual level. The wafer-thin metal diaphragm is not too dissimilar in size and mass from that of a condenser microphone and is therefore capable of an equally wide bandwidth and dynamic range. As an electromagnetic device it requires no high-impedance head amplifier so its residual noise floor, which is therefore determined only by the resistive impedance of the capsule assembly, is lower than that typical of a capacitor mic.

However, a major drawback, at least in the early days of dynamic models, was that ribbon microphones tended to be extremely bulky. The sensitivity of ribbon mics is determined largely by the strength of the magnetic field encompassing the diaphragm, and the magnetic structures available 50 or 60 years ago could only generate such powerful fields by employing massive magnets. Similarly, bulky step-up transformers were often incorporated in an attempt to increase the output voltage, further adding to the size of the assembly.

Technology Revisited

Research into new magnetic materials over the last half century has brought about dramatic technological advances. For example, neodymium magnets have been developed which are vastly more powerful than anything available before, allowing strong magnetic fields to be established using a fraction of the space required in the '50s. Similarly, metal-production techniques for ribbon manufacture and designs for audio transformers have also been improved.

Taking all these developments together, it has become possible to revisit the ribbon-microphone concept and produce a very high-quality device with similar size and sensitivity to a conventional moving-coil microphone. However, the ribbon microphone has characteristics all of its own, achieving much of the finesse of a capacitor mic, but usually with a warmer timbre which can make an ideal complement to the analytical nature of digital recording formats.

R121

The basic design of the Royer R121 is fairly conventional as ribbon microphones go, despite the adoption of sophisticated modern materials. A 2.5µm-thick pure-aluminium ribbon is supported between the poles of a powerful rare-earth neodymium magnet assembly. The magnetic motor has been carefully designed to keep the flux field where it is needed between the pole pieces and to minimise unwanted stray external fields, although the external 'ears' running down the sides of the mic body form part of the magnetic circuit around the ribbon and are capable of picking up paper clips without any difficulty!

Unusually for a ribbon mic, the R121 can accommodate quite high sound pressure levels. The specifications state that it can handle more than 130dB SPL which means that this mic can be placed in front of electric guitar cabinets, brass instruments and even percussion without too much concern.

Being a ribbon mic, the Royer has a true bipolar or figure-of-eight polar response, with the front and back lobes being equally sensitive and remarkably consistent with frequency. The side nulls are amazingly precise in the way that only ribbon microphones can be -- it is hard to beat the accuracy of a purely mechanical system like this.

The physical arrangement of the microphone capsule makes the R121 a side-address design, with 12 slots running across each side of the business end of the mic. The positive-polarity lobe of the pickup pattern is identified by the Royer logo, and the pair of vertical metal fins running down either side of the slotted grille area serve to mark (and enhance) the side nulls. The model designation and serial number are etched into the body near the base of the mic and a male XLR connector provides the electrical output. The review model had a burnished-satin nickel finish although a matt-black chrome alternative is also available.

The technical specifications are impressive, especially when compared to the ribbon mics of yesteryear! The quoted frequency response is flat within around ± 2 dB from 30Hz to 15kHz, although these figures rather do the mic a disservice. The region between about 80Hz and 1kHz

is flat to within a decibel and is roughly 1dB below nominal zero. There is a bit of a presence bulge between 1.5 and 7kHz, but only of the order of a decibel or so, and the level gradually tails off very smoothly through the uppermost octave.

The microphone sensitivity is quoted as -54dBV referenced to 1V per Pascal which equates to 2mV/Pa and is, surprisingly, only 1dB greater than the classic Coles 4038. For comparative purposes, a good dynamic mic such as the Beyer M88 would exhibit pretty much the same sensitivity and a typical capacitor mic such as an AKG C414 might be expected to be 10dB more sensitive (around -44dBV/Pa). The output impedance of the review model was 300(Ω), although a 200(Ω) model is also available. Both expect to see impedances of over 1000(Ω), but that should not be a problem at all. The equivalent noise figure for the mic can be approximately calculated as being about 14dBA, which is pretty darn quiet and allows a dynamic range in excess of 120dB!

Returning, briefly, to the mechanics of the microphone, the model weighs a modest 243g and measures 6.13 inches long with a 1-inch diameter (156 x 25mm). Internally, aside from the diminutive ribbon and magnet assembly, the only other component is a miniature transformer which provides impedance matching and voltage step-up to the output connector. This transformer also isolates the ribbon from any adverse effects of phantom power, should it be mistakenly applied to the mic. Dense wads of cotton wool pack the interior of the mic's tubular body to prevent resonances and to stop the connecting wires from rattling.

The microphone is supplied in a stylish wooden box with a microphone clip and user guide -- optional, but essential, accessories include a foam windscreen and shockmount. For stereo applications, a pair of precision-matched R121 mics can be supplied for a five percent premium over a pair of unmatched mics. As only a single mic was supplied for the review, I am unable to comment on the consistency of the microphones -- however, unlike most capacitor mics, the Royer is almost completely insensitive to variations in heat or humidity and has excellent phase linearity.

For the sake of completeness, I should mention that Royer also produce a stereo coincident ribbon-microphone system called the Royer/Speiden SF12. This mic looks, superficially, like a pair of R121 capsules mounted one above the other on a common body with a fixed 90 degree offset between them. The microphone can be used for conventional left-right coincident applications, or as an MS pair. However, the ribbon capsule is different from that of the R121 and has been developed by Bob Speiden with an even thinner ribbon diaphragm, just 2 μ m thick

and weighing 0.3mg! The frequency response, figure-of-eight polar patterns and sensitivity, however, are all very similar to those of the R121.

In Use

Ribbon microphones have an instantly recognisable character which, to my ears at least, lies somewhere between a moving-coil and a capacitor mic. It is not quite as clinically precise as a good capacitor, but not as sluggish as a moving-coil. It is smooth-sounding but without being dull, and it tends to flatter sounds, particularly brass, woodwind and voices, in the way large-diaphragm capacitor mics can do.

The Royer R121 has all of these qualities in abundance, but also brings something new. My experience with ribbon microphones at the BBC confirmed the relative fragility of the marque: drop the lid on the storage box or expose them to rapid movements of air (people blowing on them, for example) and there was every chance that the ribbon would tear. Placing them in front of a source which was on the loud side of comfortable would not be a terribly good idea either! However, the R121 has changed my views completely. This mic is remarkably tolerant of high sound-pressure levels and still manages to deliver that silky smooth sound quality with which the ribbon is associated.

I tried the mic out a couple of feet in front of solo trumpet, clarinet and violin all with excellent results -- particularly with the trumpet, which was detailed and crisp without being spitty or aggressive. The mic also sounded extremely sweet on acoustic guitar and even in front of a loud electric guitar amp. I was so impressed, I even tried it on the 122 Leslie of my Hammond and, although I was careful not to expose it to the draft of the spinning top rotor, it was quite wonderful and produced a very rich, sonorous sound indeed.

The handbook for the Royer included a sheet of quotes from a number of highly respected American recording engineers and producers endorsing it, particularly for its strengths in capturing amplified electric guitars. I can see their point -- the R121 works extremely well in this application and its particular blend of characteristics seems to complement electric guitars (or virtually any amplified instrument) very well. Part of this, I suspect, is due to the tailored frequency response which has a very slightly recessed low-mid band with an equally gentle lift in the middle and a slowly diminishing top end -- a characteristic which suits amplified instruments very well and obviates the need to perform much the same spectral shaping with the desk's EQ. As with any mic, careful experimentation with positioning is the key, and the R121's

figure-of-eight response allows a great deal of variation to be achieved with very small physical adjustments to angle and distance.

On the human voice it was very smooth and complimentary, working well with both male and female singers, and I would imagine a pair would work wonders on a choir in a nice acoustic. The bipolar pattern can be used to great effect with backing singers by putting one singer either side of the mic. Balancing the two voice levels is just a case of moving the mic along the axis between the two vocalists.

Unfortunately, I did not have the opportunity to try the microphone as part of a drum rig, although the manual suggests it can deliver good results. I don't doubt it, although care must be taken to avoid damage from excessively strong air movements -- avoiding exposing the ribbon to the air blasts from closing hi-hats, for example. Placing a good quality pop-screen or foam windshield in front of the mic would be a very sensible precaution! I gather that the lifetime warranty includes the odd diaphragm replacement here and there, but not when damage is caused by repeated abuse!

The microphone needs to be treated with a little more respect and care than most of its siblings and I wouldn't recommend its use on the live stage, but in the relatively clean and controlled conditions of a studio environment the R121 is capable of delivering a very nice sound indeed. It was susceptible to mechanical noise transmitted through the microphone cable or the mic stand, but was not unduly prone to external magnetic fields although it picked up buzzes and hums from most power transformers when placed within about six inches. The mic's own magnetic field is reasonably well contained but does exist, and care should be taken not to place the microphone too close to anything sensitive to this.

The R121 exhibits a strong proximity effect as would be expected of a pure pressure-gradient microphone like this, but only when the source is very close to the mic -- and far too close for safety. From about six inches away and going further out the sound remains completely uniform and well balanced so, to all intents and purposes, the proximity effect can be ignored.

All in all, this is a very nice little microphone indeed and a very worthwhile addition to the microphone cabinet. It is relatively expensive and most would probably see it as a luxury item, but the R121 is a fairly versatile tool which would find a lot of applications and add very useful warmth and character to many sources. Electric guitarists, in particular, could well find that this

is the microphone for capturing their sound, as it really does seem to be designed for this application above all others!

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