MODEL 104 aB . . . . . a story of improvement

Model 104 is a big success world wide.

Introduced in 1973, the Model 104 was soon regarded as one of the few compact speakers in large scale production with true monitoring quality and consistency. Many have said it could not be improved, but KEF's engineering research team have now devised a novel dividing network which audibly reduces colouration in the mid-frequency band and significantly improves transient response.

Isolating a problem

Recent work at KEF using digital analysis techniques has shown that high frequency units in particular are substantially minimum phase shift devices. This means, in simple terms, that the transient behaviour of the unit depends only upon the shape of its amplitude frequency response. So for example, if the unit has a frequency response corresponding to that of a theoretical third order high pass filter when fed via the dividing network, it will have the same amplitude and phase response (and therefore the same transient behaviour) as that of the theoretical filter. Unfortunately conventional networks cannot approach the theoretical response curve shape and in consequence not only is transient behaviour impaired, but audible colouration is introduced, often in the frequency band where the ear is most sensitive, i.e. 1-4kHz.

In common with most of todays high quality speakers the original Model 104 used a conventional third order high pass filter network to feed the HF unit. In conjunction with the T27 this gives the overall response depicted in fig. 1. Comparing these responses with the theoretically desirable curve shows several points of departure. The measured amplitude frequency response has too sharp a "knee" at 3kHz and a broad hump around 10kHz. The response falls away at higher frequencies and the rate of attenuation below 1kHz is too steep. These effects are due to the voice coil inductance reacting with the network and to

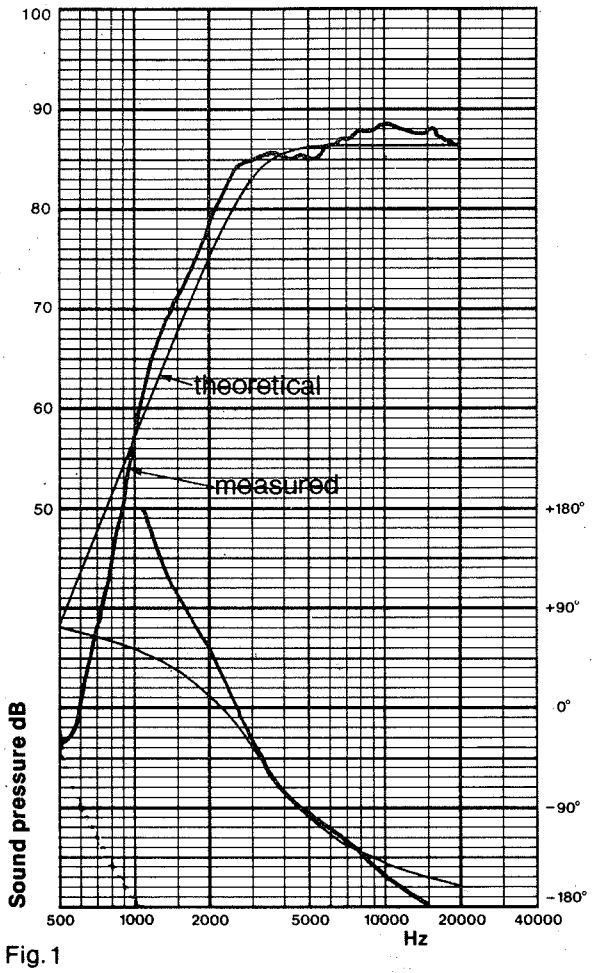
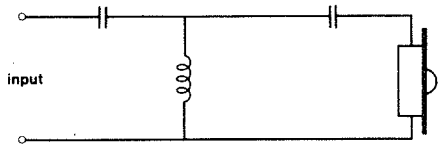
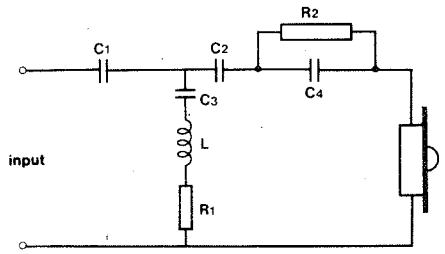


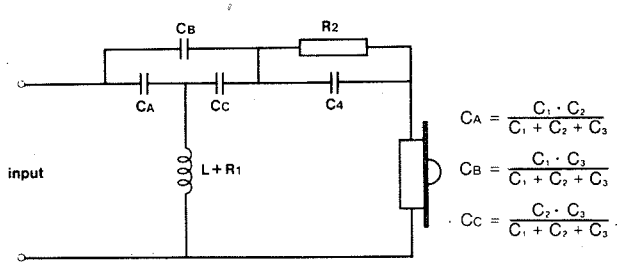
Fig. 1



Conventional 3rd order high pass network



Acoustic Butterworth Circuit



Practical realisation of Acoustic Butterworth Circuit

Fig. 2

the influence of the fundamental resonance. Overall phase response also departs radically from the theoretical curve which spoils the transient behaviour of the system as a whole.

New development

The new network shown in fig. 2 was designed by computer and in combination with the T27 it gives a close approach to a theoretical third order Butterworth response. A comparison of measured and theoretical responses in fig. 3 shows that sound output remains within ±1dB of the ideal curve over most of the frequency range from 500 to 20,000 Hz. Likewise the phase response is very nearly perfect. KEF engineers have called the new circuit an acoustic Butterworth (aB) filter network. The aB section has three functions.

1 To compensate for the high frequency roll-off due to voice coil inductance.
2 To exactly compensate for the Q and impedance of the drive unit at this fundamental response frequency.
3 To provide terminal volts on the drive unit for a constant voltage input, which vary with frequency in such a way that the acoustical frequency response corresponds to that of a third order Butterworth high pass filter.

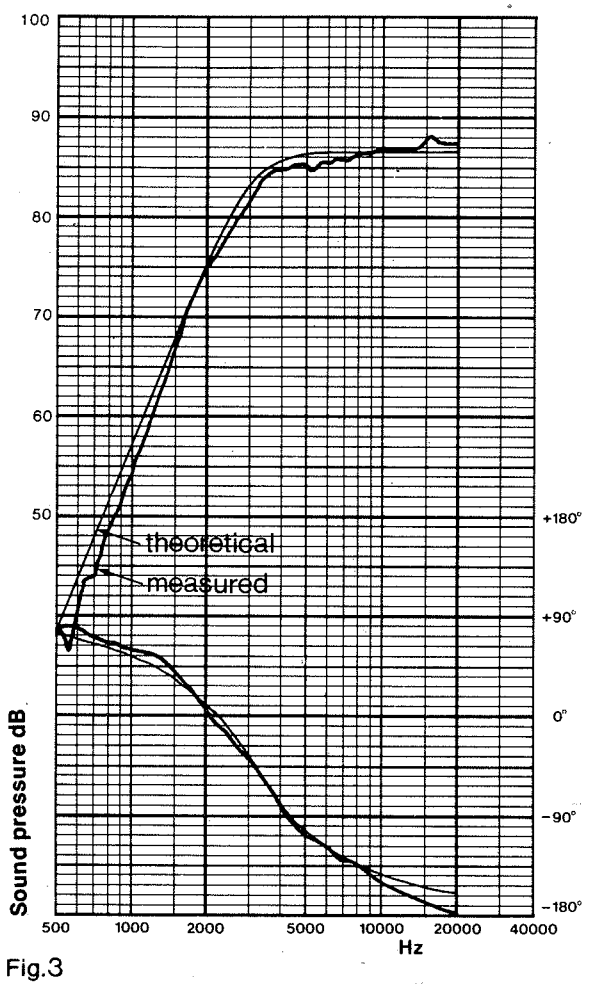


Fig.3

The real advantages

The effect of the modification is immediately audible as a marked reduction in colouration and is particularly beneficial in the reproduction of voices and stringed instruments.

The improvement in transient response gives increased depth perspective and much sharper imaging when reproducing stereophonic signals.

At the same time as introducing a radically improved dividing network to the Model 104 aB, the opportunity has been taken to fit fuse protection to the high frequency unit. Although the T27 is in no kind of danger when reproducing musical programme of all kinds with high quality amplifiers having outputs in excess of 100 watts, fault conditions such as switching transients or high speed tape spooling breakthrough can cause damage or even burn out the hf driver.

With the incorporation of this easily replaced fuse the Model 104 aB has a power rating of 100 watts.

The audible improvement is clearly demonstrable, do an aB test and hear it yourself.

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