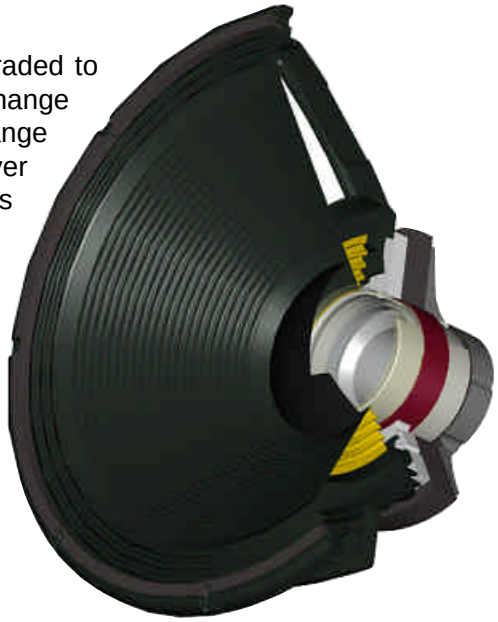
SB SUBWOOFER SERIES: "i" UPGRADE

INTRODUCTION

EAW's SB Series 18 in subwoofer models were recently upgraded to version "i". The "i" suffix on the model number indicates the change to a new driver (cutaway shown at right). This is the only change made to the Series. The reason for the upgrade to the new driver was that EAW Engineering felt the performance of the SB Series could be improved. The particular area of concern was operation at or near maximum output.



COMPATIBILITY WITH OLDER SB SUBWOOFERS

In spite of the upgrade, the new SB "i" subwoofer models are fully compatible with older SB subwoofer models. However, the new "i" versions may sound somewhat tighter and/or cleaner at higher levels. Benefits of the improved design include consistent performance over time and better product reliability.

DESIGN CHANGES

To achieve these results, there are several relatively small design changes. As such the improvement from each change is either relatively subtle in terms of listening quality or not something that could be readily appreciated from simple listening tests. However, taken in sum, the design changes add up to a significant improvement in operation at higher levels.

VENTING SYSTEM

A new venting system was designed for the magnet structure to improve heat transfer from the voice coil. At higher input levels, heating increases the resistance voice coil, reducing the power draw from the amplifier. The increased resistance also lowers the inherent efficiency of the driver. Both these effects result in less output for a given input compared to a cool voice coil. This is called power compression. The new venting system reduces power compression and enhances long term reliability.

POLE PIECE

New pole piece geometry reduces distortion due to flux modulation. Flux modulation is a variation in the driver's magnetic field. It is caused by the varying magnetic field of the signal current flowing in the voice coil. This magnetic field coil opposes that of the fixed magnet. The net effect is small, dynamic changes in the strength of the driver's motor that vary dynamically with the input signal. This effect is worst at highest levels when magnetic field from the voice coil is larger because of the higher signal currents. To counteract this, the new geometry optimizes the magnetic saturation of the pole piece to a range where its magnetic field is more stable and less responsive to external influences. This reduces distortion at higher levels caused by flux modulation.

SHORTING RINGS

Shorting rings were added to the magnetic assembly to provide the primary braking force for the cone under excessive drive levels. The geometry of the shorting rings is designed so that the braking force progressively increases with increased cone travel. This leaves lower levels of operation unaffected. Normally, the cone's suspension (edge surround and spider) provides a mechanical limitation, but only when stretched into its non-linear region This causes distortion and can lead to mechnical failure of the suspension. With the shorting rings as an electro-magnetic brake, the suspension was re-designed to allow a greater range of linear travel. The net result is a reduction in distortion at higher levels. With less mechanical stress on the suspension, long term reliability is improved.

Another function of the rings, is to provide enough braking force at the limit of the suspension's travel to prevent abrupt bottoming of the voice coil from excessive input transients.

The shorting rings also function to reduce flux modulation by opposing the voice coil's magnetic field and to some degree canceling it. This, like the pole piece geometry, helps reduce distortion caused by flux modulation.

SPIDER

A new spider (the cone's center suspension) was designed using a laminated material that maintains consistent compliance over both short and long term use. Even over short term usage, material fatigue can cause an increase in the spider's compliance. This means a reduction in its desired "springiness". Typically, the compliance will largely be restored after "resting" between short uses. However, over the long term, these short-lived changes can cause a progressive and permanent increase in compliance. Increased compliance reduces a driver’s mechanical damping, lowers its resonant frequency, as well as changing some more subtle performance parameters. Stabilizing the spider's compliance over both short and long term use provides consistent performance during a given use, as well as over the life of the driver.

CONE

The shape of the cone was re-designed with a straight-sided geometry. In addition, carbon fiber was added to the cone material. Both these changes increased the cone's stiffness-to-mass ratio without significantly changing its weight. The stiffer cone results in reduced cone flexing and cone break-up at higher levels, thus lowering distortion.

DESIGN AND MANUFACTURING

The new driver is manufactured by RCF, Italy. As one of EAW's sister companies within Mackie Designs, Inc., EAW had unique access to the design and manufacturing processes for the new driver. EAW worked closely with RCF driver engineers to refine the design for the driver's application in the SB Series. The result was the ability to maximize both the results of the design improvements and manufacturing quality.

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