ESB AUDIO

ITALIAN TRADITION SINCE 1969

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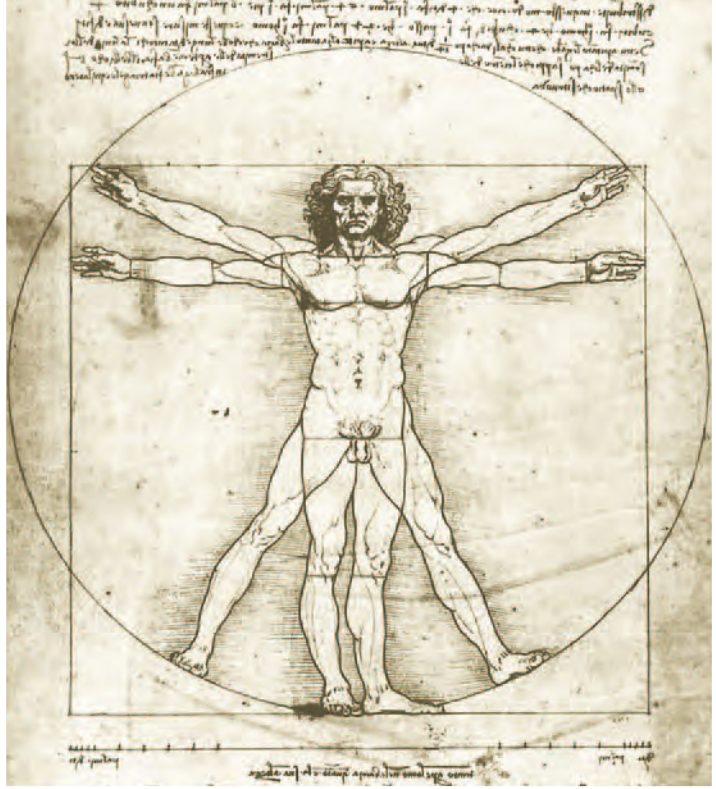
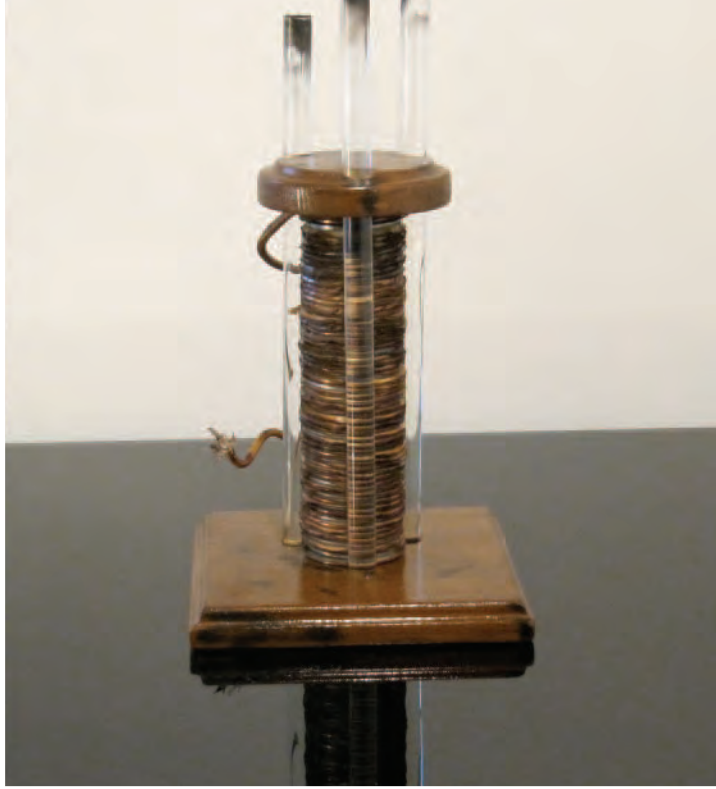
THE HOME OF CULTURE & MUSIC

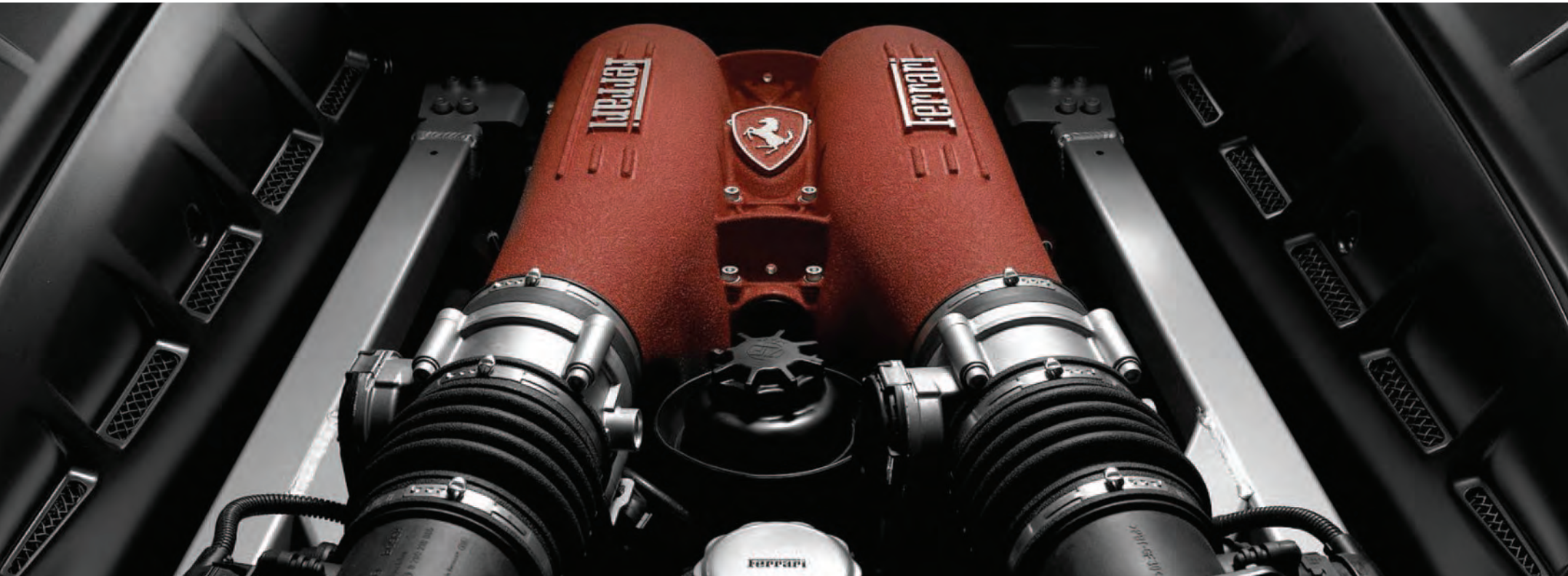
The Italian culture is the collective heritage of Italian knowledge... the fulcrum of the Roman Empire, center of the Catholic Church, a meeting point for many Mediterranean civilizations, the birthplace of many artistic movements... since ancient times, Italy has been among the most flourishing cultural centers in Europe.

Music has traditionally been one of the cultural markers of Italian national and ethnic identity and holds an important position in society and politics. Italian innovation in musical scales, harmony, and theater enabled the development of opera in the late 16th century, and much of modern European classical music, such as the symphony and concerto. Gioacchino Rossini, Vincenzo Bellini, Gaetano Donizetti, Giuseppe Verdi and Giacomo Puccini are some of the most famous composers whose works are still performed all over the world. At the same time, since the last century, Italy is the home of the world's best-known conductors, including Arturo Toscanini, Claudio Abbado, Riccardo Muti and Ennio Morricone, and the best tenors such as Enrico Caruso, Giuseppe Di Stefano, Beniamino Gigli, Tito Schipa, Luciano Pavarotti, and Andrea Bocelli.

Regarding musical instruments, the first piano was developed by Bartolomeo Cristofori, a Paduan at the Florentine court of Cosimo III de' Medici in Italy since 1698. Antonio Stradivari (1644 - 1737) was an Italian luthier and crafter of stringed instruments such as violins, guitars, violas and harps. Stradivari is generally considered the most significant and greatest artisan in this field.



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THE HOME OF ENGINEERING

Italy can be described as the home of culture and music, but it can also be considered the home of inventors, engineers and revolutionary technological discoveries.

Leonardo Da Vinci, engineer, scientist and universal talent of the Renaissance, fully incarnated the spirit of his time, leading to higher forms of expression in the various fields of art and knowledge. He is considered one of the greatest geniuses of mankind. Alessandro Volta was an Italian engineer and physicist, best known for the invention of the first-ever electric generator… the battery. Antonio Meucci was another Italian inventor, famous for developing the first voice communication devices such as the first telephone (the "telettrofono"). Guglielmo Marconi was a physicist and inventor responsible for the development of a communication system using wireless telegraphy radio waves.

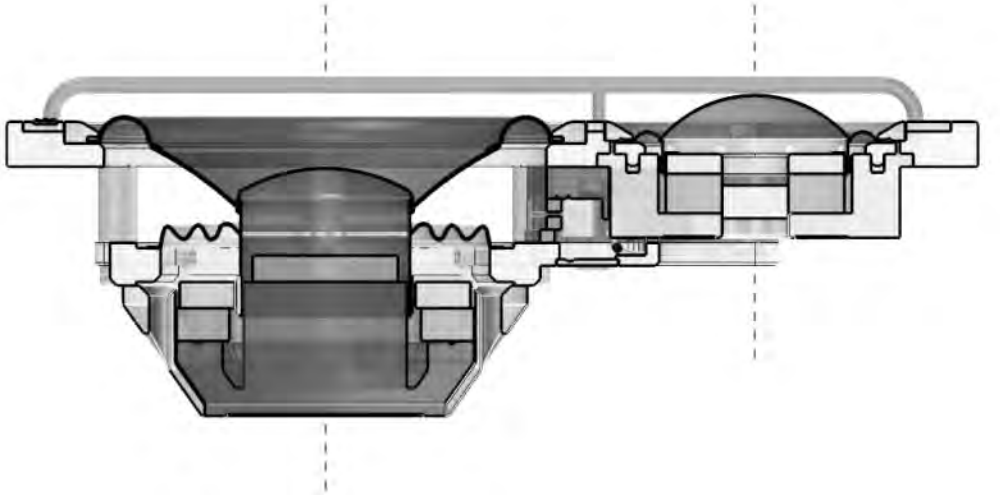
In the last century in Italy, legendary, world-famous car and motorcycle brands were also founded, such as Ferrari, Lamborghini and Ducati… companies that embody genius and the expertise to excel in their respective fields.

THE HOME OF ESB

The ESB corporation was officially founded in 1972, but three years earlier we had already entered the market with the historic 240L loudspeaker. Over fifty-plus years we have navigated the winding road of high fidelity (home and automotive) through all its evolution, acquiring a wealth of experience and knowledge that is hard to find elsewhere. It is the result of many talented people, hard work, significant investments, and great insights.

Some of the most important fundamentals in the history of high-fidelity remain a hallmark of ESB. On this page are some of them: Ideas, insights, basic applications of electro-acoustic principles, and above all, a passion for high fidelity. This is the foundation of our Italian design and development.

ESB's Car Audio Department was launched in 1984. Our strong connection to specialized magazines and our circle of acquaintances merge precisely in the famous Italian audio tradition. With a sales force comprised of more engineers than sales people, our passion for hi-fi and our knowledge to build excellent car sound systems was introduced to the automotive market.



FUTURE ORIENTED SINCE 1969

1969

The ESB 240L and The L-Series

The rise of ESB began in the late '60s, with loudspeaker models of craft and style, but with excellent build and sound quality. Quickly they established themselves in a market overwhelmingly dominated by American brands such as Acoustic Research and JBL. The first hurdle was to sell a product in an Italian market that was so in love with foreign brands. The first home loudspeaker built by ESB founder Vincenzo Biasella (at the time, ESB did not yet exist) was the 240L. This impressive speaker, with nine drivers including a 45 cm diameter woofer, was co-designed with an architect who had designed Biasella's house. The resulting speaker sounded so beautiful that others who heard it ordered their own sets. These speakers were superb with Jazz, exceeding the sound quality of famous American brands, but they also sounded excellent with classical music. Vincenzo Biasella realized he would have to build a lot of speakers. He wrote "ESB" on the back of his speakers at the connection terminals. Thus was born the ESB brand.

1975

The UMA Unit

Thanks to the dedication of Vincenzo Biasella (then the "Boss", but also the engineer) and the contribution of engineer Ferrer, ESB took a major step in advancing the art of loudspeaker design. With the purchase of a set of Bruel & Kjaer tools (which at that time cost more than a house), and the building of an anechoic chamber, ESB reached, within a few years, an industrial dimension. During those years, ESB became a prominent advertiser in audio magazines, and it was through these publications that ESB became acquainted with audio engineer Renato Giussani, who would join the ESB engineering staff at the end of 1979, assuming the role of chief engineer, alongside the founder, Vincenzo Biasella. Together, they would develop the 7 Series, which built on the philosophy that had already generated the UMA (Unità Medio Alti) aimed at optimizing the listening point... something no one had focused on before then.

1979

New Production Factory

In 1978, ESB addressed the need for "limited changes" to the company to achieve future growth. ESB began the construction of a new manufacturing facility in Aprilia, Italy. It would be an immense building for a Hi-Fi company (14,000 sq. meters for manufacturing and offices). The construction took several years to complete, but that immediately allowed ESB to make a qualitative and quantitative leap due to the acquisition of super modern machinery for woodworking and a design office that would be the envy of the best designers in the world. With probably the largest anechoic chamber by a manufacturer of speakers at that time (2,000 Cu mt), productivity quickly grew to 1,000 loudspeakers per day.

1983

The DSR and The 7-Series

ESB's 7 Series represented and still represents one of the greatest expressions in the field of music reproduction. It is a line of speakers designed and built with the sole objective of achieving the highest sound quality with any music genre in any environment. The sound characteristics are absolutely exceptional, linked to natural timbre, enormous dynamic capacity and high efficiency. But at the heart of its success is DSR, the "distributed spectrum" emission, a revolutionary technique, entirely developed by ESB's research center, thanks to the work of engineer Giussani. These incredible speakers recreate the image of the soundstage and its musicians down to the smallest detail. As Good As Live.

1984

ESB Car Audio

The ESB department dedicated entirely to car stereo was launched in 1984. Always with a strong connection to specialized magazines and a circle of acquaintances that merge precisely in the famous Italian audio tradition, Vincenzo Biasella, still active as the head of the company, introduced Gianni Caserta (who later became publisher of specialized magazines such as Giussani). Caserta was passionate about cars and convinced Biasella to make car speakers. In light of the success of the 7 Series, Giussani was asked to develop a similar series of car speakers. The impedances of the speakers changed, but the aesthetics remained the same, extending to a new 45 cm subwoofer. It would become a great success together with the mid-low 1000 MB and the UMA unit. The range was soon enhanced with very special dedicated crossovers. With a sales force comprised of more engineers than sales people, the passion for hi-fi and the knowledge to build excellent sound systems for the car was introduced to the automotive market.

1985

NCA National Car Audio

In March of 1985, ESB organized a skiing holiday in the beautiful mountains of Northern Italy and invited some clients and audio journalists to relax and... talk about high fidelity. It occurred to someone to listen to the audio systems in the cars of the participants (coincidentally, every car had an audio system), and it was decided to evaluate their characteristics. A discussion was followed by a ranking. The first car stereo competition, perhaps in the world, was born, without anyone noticing it (the IASCA trophy would come later). The result was that many car audio enthusiasts wrote asking to participate in the next ESB skiing holiday in order to obtain a qualified judgment and perhaps some advice from the journalists themselves. The requests were so many that a series of competitions were soon organized throughout the Italian territory. Regulations and a judge's school were developed in short order, resulting in the first Italian car audio trophy and hundreds of car audio enthusiasts competing in as many provincial and regional competitions.

1993

The New 7000 Series

Over the last decade, ESB produced reference-quality speakers, designed and manufactured solely for use in the car. These excellent speakers were added in 1993. This new line was named the 7000 Series, as they were a match to the famous 7 Series home speakers. The 7000 Series was greeted immediately with critical acclaim, thanks to their remarkable sonic characteristics and absolute top-level construction. Particularly notable were the UMA-800 unified mid-high unit and the 480-S2 46cm subwoofer, but many other components were also made to complete the Series.

2005

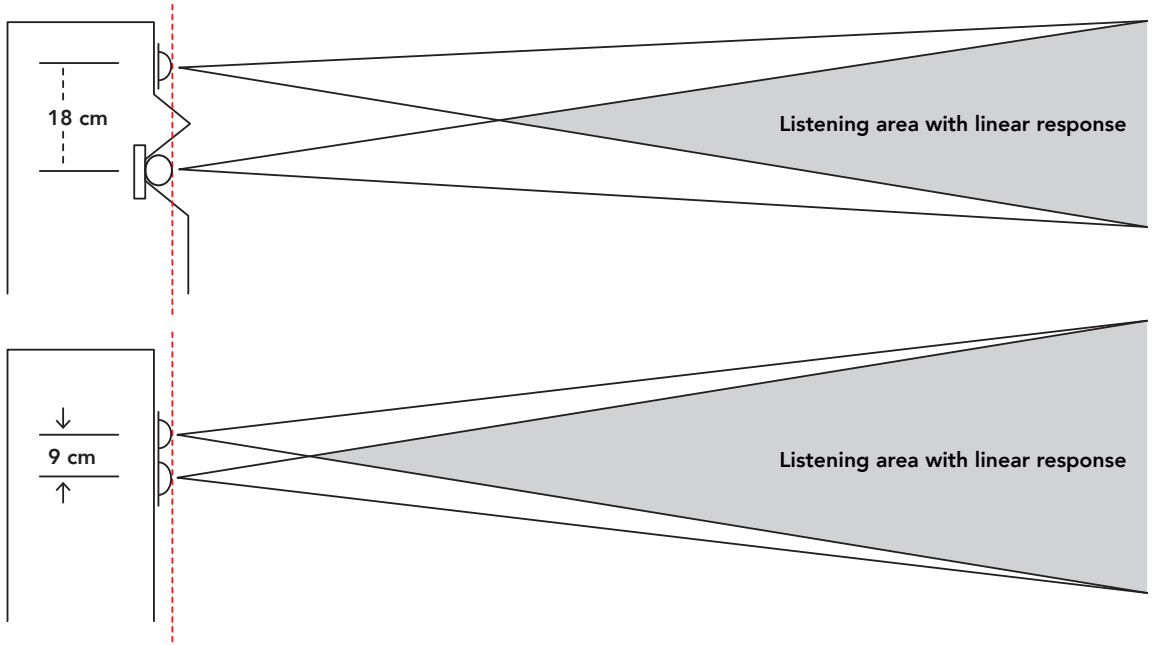
MB Car Audio School

When ESB's corporate, engineering, and manufacturing facilities were built in Aprilia, Italy, a small "mall" was built in the basement area that included a small but totally useable cobblestone street that was home to several Hi-Fi shops stocked with audio gear. Here, audio professionals could train reps and salespeople on current audio advances. Knowledge is power, and knowledge advances the industry and everyone in it. As car audio was growing and ESB was entering the car audio market, new levels of education were needed. A full installation and fabrication center was added to the mall for the training of car audio sales and installation personnel. The National Car Audio Trophy has been a unique and profound experience as far as transferring know-how quickly and effectively from ESB and NCA members to installers. MB Car Audio School was the complement that allowed the same installers to refine their techniques and to gain knowledge in an environment that could be compared to a graduate course, with students earning the equivalent of a Master's Degree.

INNOVATIONS

In Phase Stability, the DSR System and Digital Processing: Fully developed in the ESB research center, after considerable acoustic field research, these technological goals have now been adopted by many other speaker manufacturers. Here is a brief summary of the technical innovations introduced by ESB.

The basic steps of our history



THE PHASE AND THE RESEARCH

Before early 1970's, virtually all speaker manufacturers in the world positioned their speakers on front baffles following a logic of design rather than acoustics. The arrangement was to put the tweeters at the top and midranges and woofers at the bottom… mainly a matter of size. Then someone decided it was better to arrange the speakers in phase, aligning the acoustic centers by making them equidistant from the listening position. After considerable acoustic field research, ESB reached some conclusions about sound reproduction and fidelity. These conclusions have since been adopted by many other speaker manufacturers. Our conclusions were:

1) The equidistance of the centers of the speaker drivers from the listening point is not critical for a woofer, and have minimal effect at the coupling of a midrange and tweeter. Therefore, it makes no sense to position speaker drivers on different planes. (In fact, "phase aligned" loudspeakers soon disappeared).

2) The centers of the speaker drivers that reproduce the mid-high frequencies must be aligned on a vertical line.

3) The location of speakers that reproduce the mid-high frequencies must be asymmetric as it relates to the center line of the speaker enclosure.

4) The speaker drivers that reproduce the mid-high frequencies should be as close as possible, with reference to the frequency at which they intersect.

Thus, was born what became known as UMA (Unit Medium High) or Mid/Tweeter, mounted adjacent to each other on the same flange. UMA distinguished virtually all future design and production at ESB.

Phase and the Research

(Published in the 1975 ESB catalog, shown above)

The most relevant and oft discussed topic in the field of loudspeaker design these days is "phase". Speaker builders around the world produce models with diffusers and speakers drivers arranged on different planes. These designs are an attempt to align the acoustic centers of the drivers to allow perfect phase response. They have built number of very sophisticated tools that can detect phase differences of only a few degrees between the waves from the various drivers in the speaker system. At the same time, conflicting views on the sensitivity, or lack thereof, of the human ear to detect delays of a few milliseconds, corresponding to phase differences of several hundred degrees, called the whole issue into question. But consider, for a moment, that the human ear is at least as sensitive to phase as the best tools. Suppose the recording of a musical piece is carried out impeccably (unlikely given the presence of microphones in various locations during the recording). Suppose also that the mixer, equalizer, disk or tape, the recorder, and the amplifier do not induce any phase distortion, and the signal reproduced by the loudspeaker maintains the same phase relationships as the original signal. Still, the listener remains the concern. He must be in the position recommended by the loudspeaker manufacturer in relation to the position of each driver on the front panel of the speaker. If the listener is out of position, phase lags will be far greater than those that might be introduced by the recording/playback systems. And all this makes sense only if the high playback quality of the "perfect" speaker is actually appreciated by the human ear in normal use with musical program material. Among today's engineers, rather than phase shifts, they prefer to speak of signal delay; the difference in time it takes signals from each driver to reach the ears of the listener.

This does not change the nature of the problem; it is simply looking at it from a different angle. Practical controlled tests show in this case that the human ear is unable to perceive quality differences in the signal when these delays are contained within a few tenths of a millisecond for the medium-high frequencies and up to a millisecond for the lower frequencies. Evaluated in these terms, and making more practical considerations for actual and theoretical listening, the "phase" remains a topic whose importance is yet to be demonstrated, and not the one that is assumed in many manufacturers' advertising pages.

About ESB, engineers have said: it is preferable to have the speakers perfectly in phase with the original recording, but the price of the required constructive solutions are not justified when other factors can have a greater effect on the quality of reproduction. A far more important consideration is to have the speakers' crossover frequencies not only on the axis of the speaker, but if possible, on as broad a projection as possible. The crossover frequencies simultaneously operate on two speakers. If at the listening point, their signals arrive in opposing phase, they will interfere with one another, creating a hole in the frequency response that theoretically matches the annulment total. It can be 10dB or more. This is easily noticeable because the width of this hole is generally equal to 2 or 3 third-octave bands. For signals to maintain a proper phase relationship, it is necessary that the speaker distances (at the acoustic centers) from the listening position differ as little as possible. The maximum difference is preferably not greater than one third of the wavelength; in this case, the hole is only 3dB. Let's take an example. Suppose we have two speakers whose frequency bands are crossed at around 5000 Hz. The wavelength of this frequency is equal to 6.8 cm. We will have a correct response in amplitude in space in the front of the speakers when the difference of the distances of the two acoustic centers from the listening point is less than 2 cm. Clearly, the closer the acoustic centers are and the more distant the listening point, the greater the linear response listening area will be. In the case where the speakers (arranged on a vertical axis) have 18 cm of separation between them, and the listening is at a 3 mt distance, the response is linear at every point of the space comprised between +/- 30 cm with respect to the horizontal axis. In normal listening conditions, that makes the positioning of the speakers more critical and the sound accurate only in a narrow front field. In the case of a cross between a woofer and midrange of 600 Hz, as one third of the wavelength is about 20 cm, it is easy to verify that if the acoustic centers, even not perfectly aligned (+/- 5 cm), do not fall more than 30 cm, then more than two meters of the response will be linear throughout the listening environment. To optimize the linearity of the response to the environment, and the crossover between midrange and woofer, ESB's100 LD speaker designers have, as much as possible, addressed the acoustic centers of these speakers. Reducing the distance to 9 cm allows the assembly of the two components on a single flange. This new arrangement, called 100 MTD (Midrange Tweeter Dome, later UMA - Unit Middle High), enables a linear response at a height of 120 cm high. This design reduces the critical placement of the speaker.

THE D.S.R.

(Published in the 1984 ESB catalog)

The concept of "Acoustic Spectrum Distribution" of audio frequencies is applied in DSR in two distinct modes that we call, for simplicity, Horizontal Distribution and Vertical Distribution.

The Horizontal DSR

In any stereophonic system, the maximum amplitude of the reconstructed acoustic scene is coincident with the distance that separates the speakers. In any listening position, the listener perceives an overall signal consisting of the sum of the value of the direct field (the sound arriving at him directly from the speaker) and the reverberant field (the sound arriving at him from reflections) that form the sound environment. In the pattern of acoustic transmission of the musical signal in the normal home environment, the sound pressure level characteristic of the reverberant field is clearly predominant in the low frequencies, while at the high frequencies, the direct sound is predominant.

The Problem

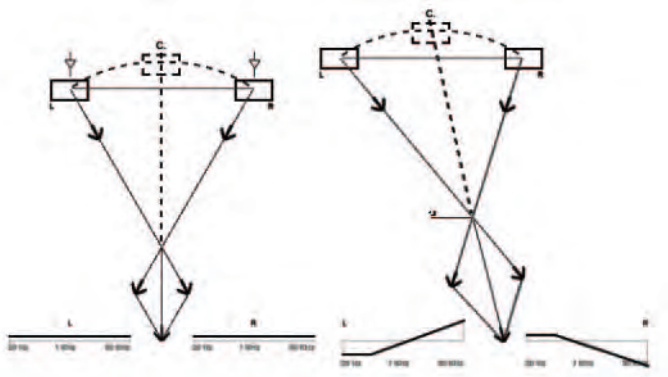
If the listener is equidistant from two speakers and they emit equal signals, the source of what the listener hears will be precise and centrally positioned between the two speakers. But when the listener cannot be in the exact axis of the symmetry of the system, then the shift from the ideal location will cause an increase in sound pressure of the direct signal from the near speaker and a decrease from the far speaker. The important thing to note in terms of perceived overall field: Because of the existence of the reverberant field, and the restrictions placed on the listening area in the normal home environment, there will be changes in the levels and perceived position of many frequencies, mostly above 1,000/2,000 Hz. The level changes that eventually come into play at lower frequencies can be high or low depending on the development of the field of early reflections and standing waves that will be established in that particular environment and, as such, are not to be taken into account for listening position.
So, the effect of listening to an asymmetric position, with speakers traditionally oriented (standard, unidirectional, or wide dispersion), will always be affected by two types of distortions:
1) Perspective: following the localization of sources favoring the closer speaker. This occurs for all sources except for those generated by dedicated left or right signals for which the apparent width of the acoustic scene does not vary, but is deformed by compressing one side and expanding the other.
2) Timbre: resulting in the decrease in the level of high frequencies from the far speaker and an increase of high frequencies from the near speaker.

The Solution

In a classic experiment, Stevens and Newman (1) show that to locate the sound sources in the space of the sound field, the auditory system utilizes the information of both time and intensity. Or, in the presence of two identical sound sources working with the position of apparent center, the listener will seem to be closer to one signal if it is stronger than the other, or if it arrives before the other. But the experiment also showed for frequencies below 1,500 Hz, the arrival time was the overriding factor for localizing the position, and for frequencies above 3,000Hz, the differences in intensity were more dominant. Let us recall what was said on the subject of direct and reverberant origins. Whereas the acoustic field at low frequencies often suffers from irregularities relevant to reflections and standing waves. While the reverberant field and standing waves are largely a function of the listening environment, the stereo speaker system, designed to provide correct variations of intensity in the mid and high frequencies, can do much to maintain correct spatial information.
This new approach to DSR (horizontal), intended to solve the problem of deformation of timbre and perspective for listening positions not equidistant from the two speakers, consists of the following two propositions:
1) In a normal home environment, localization of virtual sources in a correct soundstage depends mainly on differences in intensity between the left and right channels at frequencies above 1,000 / 2,000 Hz;
2) The system must compensate for perspective distortion with a speech function of frequency to obtain a correct timbre over the entire listening area provided.
As demonstrated above, the invariance of the localization of virtual sources can be achieved, even in the presence of lateral movement of the listener, by orienting the axis of maximum emission level of the mid-high frequencies of each speaker to the other extreme of the possible listening positions. The result from research is that the change in level of the medium-high frequencies caused by the displacement from the listening position <1> to the <1'> is compensated by a level variation of opposite sign, as a function of the angle of emission. The orientation of the emission lobes shown gets an effect of the desired type and, by appropriately dimensioning the various parameters, this effect can be made exactly opposite to that caused by a lateral movement, extending the expected listening distance. In the presence of electrical signals having the same spectrum at the input terminals of the two loudspeakers, the listener will perceive from "L" and "R" a total sum of the respective direct fields with the reverberated one.

The total will be the same for any reasonable listening position; i.e. for each, the desired invariance perspective of the acoustic soundstage is the invariance timbre of each virtual source it contains. The 7/06 speakers correspond exactly to the orientation needs (34 degrees) for a listening distance equal to 1.5 times that which separates the speakers (central listening in front of the woofer panel inclined by 18 degrees). This condition is also predicted by Kates (2) in his table 1 for Y/D1=3, and the theoretical solution designed at "high frequency" contemplates a dispersion lobe of width -3dB of 90 degrees. In the case of 7/06, the hypothesis of the formation of a reverberant field having a behavior as a function of frequency depends on the acoustic characteristics of a typical home environment and the result of the invariance of timbre over the entire listening area resulted in a lobe dispersion of amplitude varying between 110 to 2,000 Hz degrees and 60 degrees to 12.5 KHz with a value of 90 degrees to 4,000 Hz. The final result is that, compared to the conventional proposal, these speakers, in addition to having the axis of maximum level suitably oriented, are characterized by a dispersion suitably limited and decreasing continuously with an increase of the frequency, according to a predetermined pattern.

From a decision to distribute the audio spectrum horizontally as a function of the angle of emission, we receive the following advantages:
1) The possibility to properly resolve the horizontal structure of the acoustic soundstage in the various virtual sources from any primary listening position.
2) Perception of sonic information from each source that is correct at any listening position within the field.



THE DSR SYSTEM, THE TECHNOLOGICAL HEART OF THE ESB 7 SPEAKER SERIES, WAS A REVOLUTIONARY INSIGHT.
THE SYSTEM HAS ALLOWED US TO REPRODUCE, FOR THE FIRST TIME IN GREAT DETAIL, THE SOUNDSTAGE AND THE PERFORMERS, PLAYING A MUSICAL PROGRAM.
AS GOOD AS LIVE.

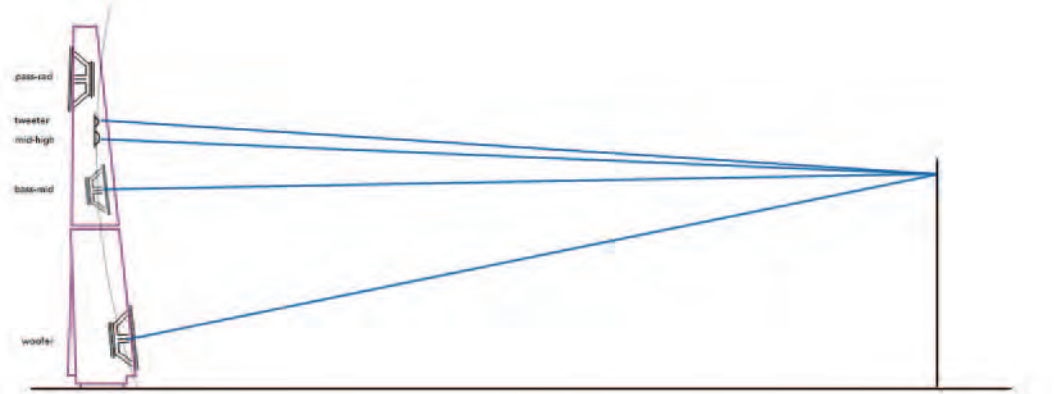
The Vertical DSR

The speakers have a height 7/06 as compared with the other two dimensions, and speakers are located at considerable distances from each other. For example, between the center of the woofer and that of the mid-low of 7/06 is a distance of 63 cm, fairly normal for a conventional design. However, the logic of "maximizing" dispersion angle free from alterations requires arranging the component vertically on the panel of the diffuser at a minimum distance between them, and possibly less than 1/2 of the wavelength of the crossover frequency. In the DSR system, such distance is chosen rather than values near a whole wavelength at the crossover frequency (woofer with low average).
The considerations that are the basis of this choice take into account our auditory system as a function of the angle of reception and vertical frequency (Rodgers, 3).
The actual acoustic sources are placed in a three dimensional space and they themselves have three dimensions. Our auditory system is able to distinguish the various signals it receives from different directions, both horizontally and vertically, and thanks to the different location in space, it can select the better signal that it wants to "pay attention" to, separating out ignoring others simultaneously present (eg. like when you talk to a person in in a crowded room, "Cocktail Party Effect").
With an acoustic source (the speaker) which issues all signals from a single point, this operation on the vector intensity is not an issue. The sound simply is. But, distributing the areas of emission on the vertical dimension of the speaker (not as disturbing as the stereo effect horizontal) so that different signals correspond to different areas of emission, requires the auditory system to analyze the various signals using differences if the spectrum and the reception angle to find the sum result.

There is no doubt that this listening situation is more realistic than that in which the three dimensions of the real world are reduced at the center of a "pulsating sphere". A distance of the transducers higher than that chosen (by contradiction of some meters) would lead to the difficulty where-in the auditory system must consider each speaker as the acoustic source coherent; as saying that various portions of the spectrum emitted by elements would appear as completely separate. This would prevent the possibility to reconstruct the feeling of unique signal originating from a single extended source, uniquely positioned in the space. This condition must be necessarily respected independently for the issuance of the spectrum of each virtual sound source, regardless of the maximum vertical size and the portion that will be subjectively attributed.

Distributing the audio spectrum in the vertical direction, as a function of the angle of reception, yields the following advantages:
1) Possibility to solve the overall programs in the various elementary signals;
2) Contribution to the soundstage of a realistic virtual vertical dimension;
3) Size sensing of the zones of emission as a function of the emitted spectrum congruent with the actual situation.

By distributing the audio spectrum in both horizontal and vertical, results in the advantage of giving the acoustic soundstage a 3-dimensional space in which the physical presence of the speakers is less perceptible.



The DSR system deploys the audio spectrum vertically according to the angle of reception. The result is a realistic soundstage with a vertical dimension within which it is easier to distinguish the different music sources in their correct locations.

DOUG SAX AND THE 7/06

"...we hear a vocal - Amanda's, it so happened-coming from some unknown speaker. It is instantly obvious that this is the best I've ever heard her sound, save for standing next to her. We went in and sat down and really listened. Everything sounded glorious and musical. I introduced myself to Arthur Regal from Cedarhurst, N.Y. He is president of ESB USA and will be importing the ESB line from Italy. He asked me if I would like to hear some other Sheffield records. No. anything but that. He then put on a Proprius recording, Cantate Domino. Again, the best reproduction of voice have ever heard.

Impressed out of my shorts, we bade adieu to ESB and ventured further down the hall where I had a rather joyous meeting with my old friend Leode Gar Kulka of Sonic Arts. I met Leo in 1961 when Lincoln and I were attempting to make a direct-to-disc recording of a solo piano -and mono at that. He had the only Neumann cutting system In Los Angeles. He played some of his new recordings for us, and I ran around the show until I collared a pressing of our disc of Arnold Steinhardt and Lincoln doing the Strauss sonata, it sounded unfamiliar on the set-up in Leo's shared room, and next door we tried it on some weird-looking speaker that sounded even weirder. Since I feel this is the best recording I have ever made, was disappointed that I couldn't show Leo its virtues.

Bob suggested that we go back to ESB to listen to the Strauss, great idea, Bob. We went and listened to the whole sonata. I can't remember the last time that listened through a complete work. The result was stunning, way beyond accurate; a seamless, effortless recreation of the instruments, the room, the musician's interplay and emotion- I have never heard a speaker re-create the spatiality of these Italian wonders. The ESB 7/06, a restorative experience.

It was then 9 p.m. and everyone famished. We went to the buffet at Circus with Bob Neil, Arthur Regal, and Renato Giussani (the designer of the ESB 7/06). I pumped Renato concerning the design parameters of his wondrous loudspeaker. Apparently he has done much research into what a speaker must do to allow the ear to receive space and depth information. What we all heard was no accident. As a professional, I can guarantee that the speaker will fail in many areas; as an audiophile tor a day, I know it is the finest loudspeaker I've ever heard"

the absolute sound

Doug Sax was the founder of the Sheffield Lab (specialty record and disk production company and creator of many of the best Direct-To-Disc recordings ever made, revered by audiophiles worldwide). After a visit at the CES, performed in Las Vegas Jan. 1983, this was a letter he sent to the Absolute Sound (Best audiophile magazine of USA). From 1979 to 1984, Renato Giussani took on the role of Chief Engineer of the Research and Development Department of ESB, designing all the models in the numerous series produced in those years, including the LD, XL, CS, QL, FX, DCM series. and the glorious 7-Series. Renato Giussani had a fundamental contribution to the invention of the DSR (Distributed Spectrum Radiation), applying it to the 7 Series models, the most famous of which was the 7/06 model.

CAR AUDIO

The ESB department dedicated entirely to car stereo was launched in 1984. Always with a strong connection to specialized magazines and a circle of acquaintances that merge precisely in the famous Italian audio tradition, Vincenzo Biasella, still active as the head of the company, introduced Gianni Caserta (who later became publisher of specialized magazines such as Giussani). Caserta was passionate about cars and convinced Biasella to make car speakers. In light of the success of the 7 Series, Giussani was asked to develop a similar series of car speakers. The impedances of the speakers changed, but the aesthetics remained the same, extending to a new 45 cm subwoofer. It would become a great success together with the medium-low 1000 MB and the UMA unit. The range was soon enhanced with very special dedicated crossovers. With a sales force comprised of more engineers than sales people, the passion for hi-fi and the knowledge to build excellent sound systems for the car was introduced to the automotive market.
Thus, ESB started another new era... that of car audio.

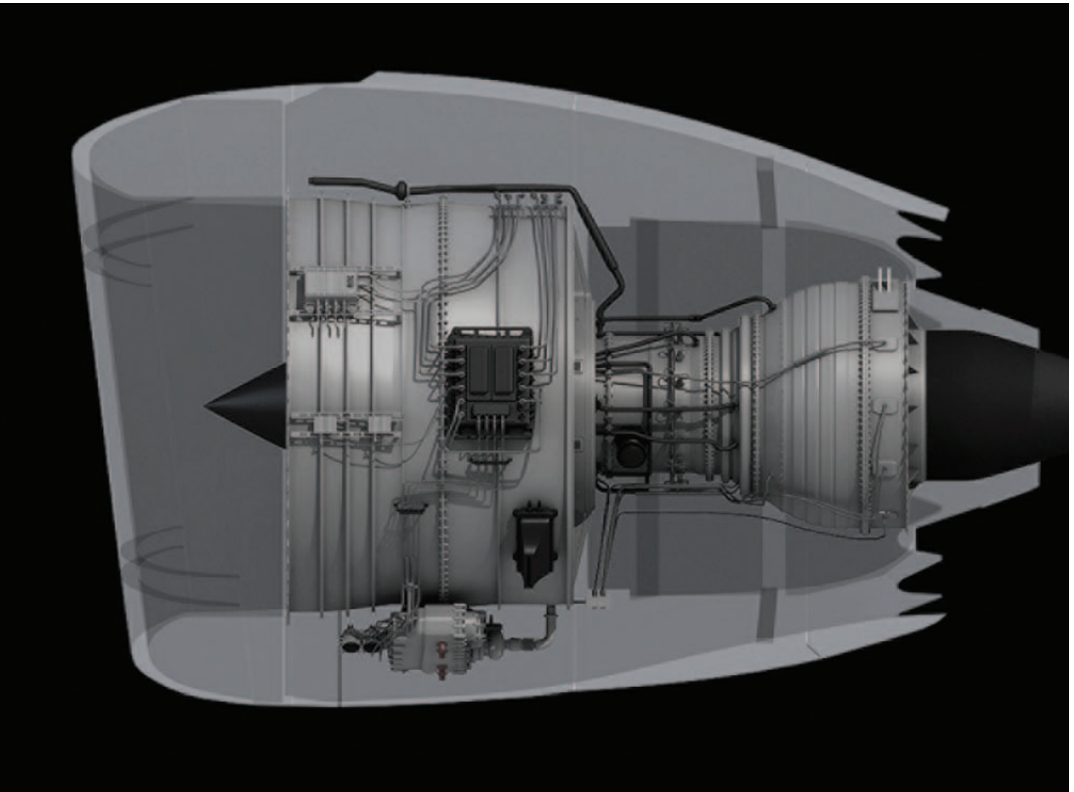
In March of 1985, ESB organized a skiing holiday in the beautiful mountains of Northern Italy and invited some clients and audio journalists to relax and... talk about high fidelity. It occurred to someone to listen to the audio systems in the cars of the participants (coincidentally, every car had an audio system), and it was decided to evaluate their characteristics. A discussion was followed by a ranking. The first car stereo competition, perhaps in the world, was born, without anyone noticing it (the IASCA trophy would come later). What happened? The journalists present at the skiing holiday published in their respective magazines an account of that week consisting of ratings and comparisons. The result was that many car audio enthusiasts wrote asking to participate in the next ESB skiing holiday in order to obtain a qualified judgment and perhaps some advice from the journalists themselves. The requests were so many that, once again, thanks to the intuitive genius that was abundant within the ESB staff, a series of competitions were soon organized throughout the Italian territory. Regulations and a judge's school were developed in short order, resulting in the first Italian car audio trophy and hundreds of car audio enthusiasts competing in as many provincial and regional competitions. It would be called the NCA Trophy.

The know-how acquired over the years, the result of the great commitment that the competition required, was transmitted to all the Italian installers who were able to enjoy an absolutely new and rare experience, original for Italy and probably unrepeatable. The American trophies began a few years later, with the IASCA being the first. The Italians of the NCA immediately positioned themselves with their own installation and listening philosophy, in contrast to the American approach which favored extremely accurate listening of a well-integrated car system. This made aesthetic solutions widely popular and turning the passenger compartment into a unique space, as well as the trunk. The Italian Car Audio Installation School was born. It would echo throughout all of Europe first, then in the rest of the world. Subsequent European trophies would follow the Italian path rather than the American one.

CAR AUDIO SPEAKER SERIES

For over thirty years, ESB has specialized in the engineering and construction of premium speakers for automotive applications... offering different product lines, all united in true fidelity to the musical source.

True to Quality. True to the Music.
Pure Performance, Accurate Reproduction.

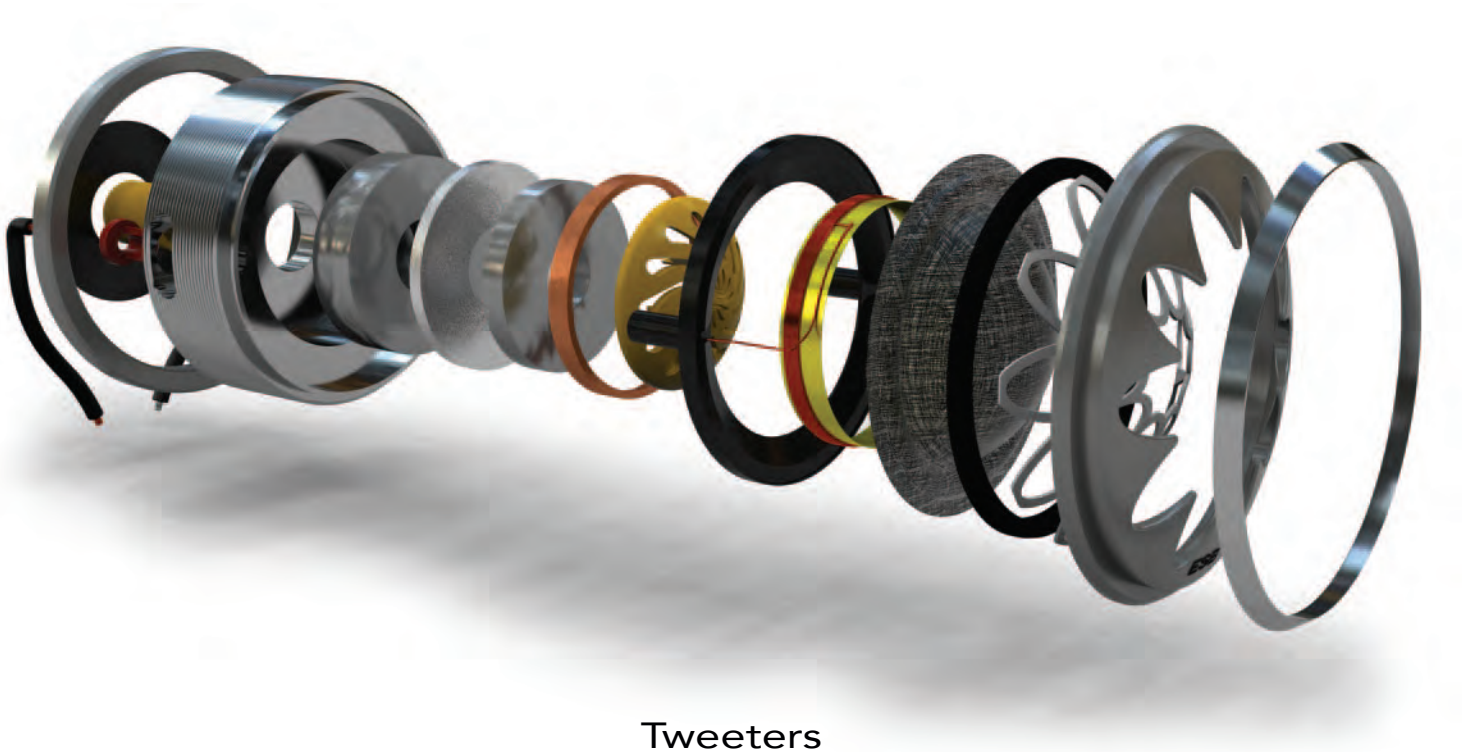



ESB
ESB

9000 Series

Merging Advanced Aircraft Engine and Speaker Technology

The new 9000 Series consists of some of the most technologically advanced car speakers ever produced. Technology and design come together in a new and unusual aesthetic, thanks to the particular flower shape of the flanges around the tweeter dome, and in the baskets of the cone speakers. But the unique shape was not to achieve an aesthetic form factor. It is an expression of ESB's innovation. The result is that the acoustic refraction on the edges of the speakers will be less damaged if the outer edge is not equidistant from the center. An analogy can be found in the new Rolls Royce aircraft engines that have the same shape on the back edge (where the greatest turbulences is). This is not just a random analogy; both are constructive choices... effectively channeling the air flow outside. That's just one inspiration for a speaker series full of technical innovation.



Tweeters

• TCA System (9.1T-28) for back air flow control which reduces turbulence, noise, and controls the damping of the dome.

• Pole cup CNC machined from a solid piece of ultra-low-carbon steel.

• Main magnet made from N52H neodymium, best both for the magnetic force in relation to the mass, and for high temperatures support (120° F vs. 80° F of a standard neodymium magnet).

• Secondary or superior magnet (9.1T-28) used to stabilize and regulate the magnetic flux and concentrate it only in front of the voice coil, increasing efficiency, manageable power, distortion and bandwidth.

• Pure copper ring helps reduce the inductance of the voice coil so that it offers minimal resistance during high frequency reproduction. This means better high-frequency response.

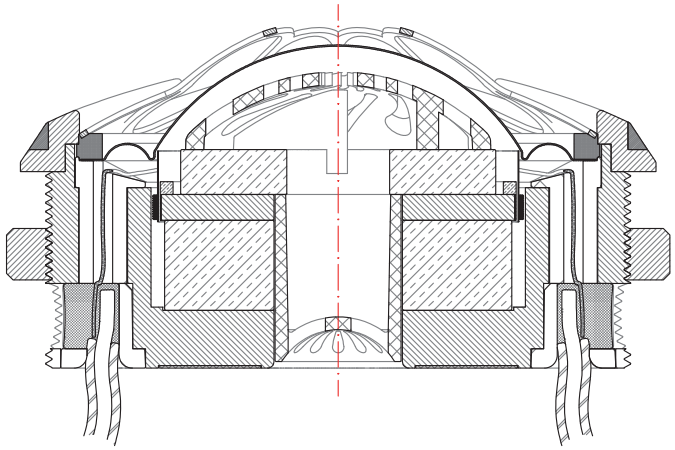
• FCA System (9.1T-28): a special structure to control the flow of air moved by the dome. This creates a periodic damping resistance and dictates that the release of the energy accumulated in the movement of the dome occurs in a controlled and fast manner, without creating persistent oscillations.

• Super light aluminum voice coil uses a high-strength aluminum alloy to reduce its thickness and its weight. The winding is also aluminum with a pure copper "skin". This results in a perfect combination of resistance and weight of the wire.

• Pure Japanese silk dome resin impregnated with integrated suspension. This catenary profile dome is made in a single piece that also includes the suspension. This greatly reduces the weight, allowing the tweeter to reproduce very high frequencies. The absence of joints prevents break-up and/or vibrations.

• Light stainless steel grill for dome protection.

MADE IN A SINGLE PIECE WITH SUSPENSION, THE PURE JAPANESE SILK DOME GREATLY REDUCES WEIGHT ALLOWING THE TWEETER TO REACH THE HIGHEST FREQUENCIES WITHOUT VIBRATIONS.
THE FLOWER FACEPLATE, WORKING AS AN ACOUSTIC LENS, DRAMATICALLY REDUCES SIDE REFRACTIONS.



9.1T-28 magnet group

Main magnet made from N52H neodymium, best both for the magnetic force in relation to the mass, and for high temperatures support (120° F vs. 80° F of a standard neodymium magnet). Secondary or superior magnet (9.1T-28) used to stabilize and regulate the magnetic flux and concentrate it only in front of the voice coil, increasing efficiency, manageable power, distortion and bandwidth.

UMA Unit

A legend, renewed

2-Way Mid-High Unit

• The damping material controls the tweeter air flow and creates aperiodic resistance.

• Large neodymium magnet. This high-temperature resistant neodymium magnet is one of the most powerful, and the special design ensures that the lines of force are focused right where they're needed without any leakage.

• Felt damper for controlling and reducing the tweeter dome's resonance.

• Wide 25 mm lightweight aluminum voice coil with aluminum copper clad winding contributes significantly to the large bandwidth extension of this tweeter.

• Silk dome impregnated with resin with integrated suspension. Made in a single piece, this greatly reduces weight, allowing the tweeter to reproduce very high frequencies. The absence of joints also prevents break-up and/or vibration phenomena.

• CNC-machined billet aluminum flange allows the midrange and tweeter to be mounted using screws so the two speakers can be replaced if need be.

• Integrated terminal connector located between the midrange and tweeter, made of pure gold-plated copper, accepts large gauge cables, and which are secured using allen screws.

• TCA, to control the flow of air moved by the midrange cone, creating aperiodic damping resistance that ensures the release of energy accumulated in the movement of the speaker occurs in a controlled and fast manner, without creating persistent oscillations.

• Die cast-aluminum and powder-coated basket (midrange) offers very low resistance to the passage of air, and its shape (verified by FEM analysis) reduces vibration and resonance.

• Wide, lightweight Nomex voice coil with aluminum winding.

• Large balanced Conex™ spider damper device ensures linear excursion in both directions thereby reducing distortion.

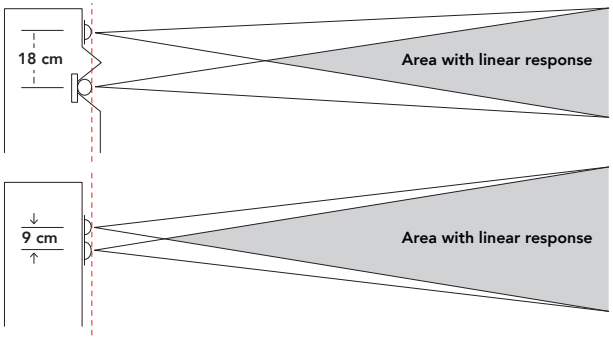
• The cone is made with vacuum and autoclave molded high-modulus carbon, a technology rarely used in speakers because of its cost, but it brings enormous benefits in terms of naturalness of reproduction and high dynamics at transients.

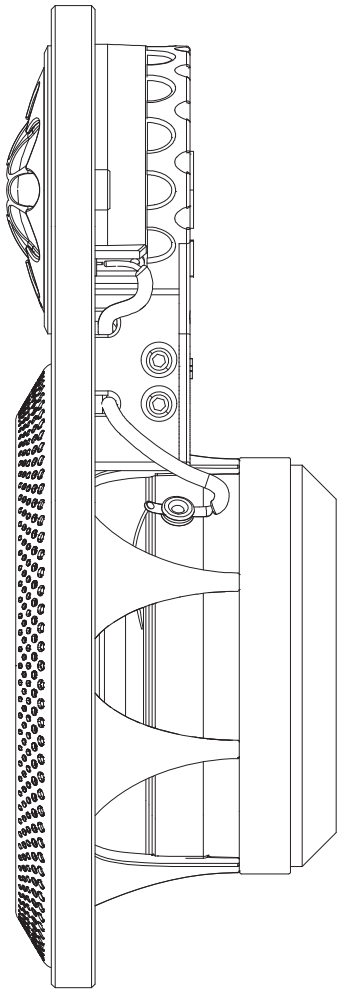
• The NBL rubber surround has a shape designed to ensure very smooth movement at very low excursion, becoming increasingly controlled as the excursion increases and approaches the limit. This, too, helps to make this speaker extremely dynamic and capable of handling high powers.

THIS SPECIAL COMPONENT IS A CONCEPT CONCEIVED IN 1970's. ITS AIM IS TO CONCENTRATE MID AND TWEETER EMISSIONS IN A VIRTUAL SINGLE POINT. THIS MINIMIZES PHASE DELAYS AND IRREGULARITIES AT THE CROSSOVER POINT.

Combined, the two components are able to reproduce with perfect linearity all the spectrum from 130 Hz to 25 KHz.

(Learn more about "The Phase and the birth of the UMA unit" at: esbcar.com/the-phase)

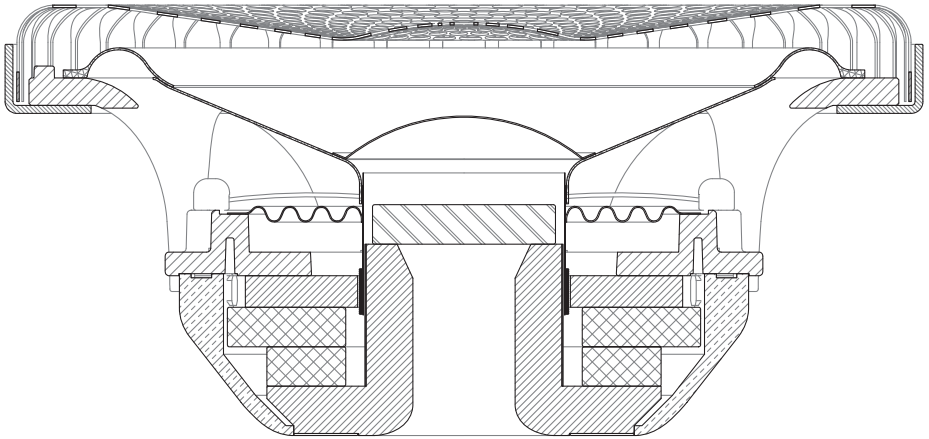




Removable components

CNC-machined billet aluminum flange allows the midrange and tweeter to be mountedusing screws so the two speakers can be replaced if need be.

- Removable tweeter.
- Removable midrange.
- Independent connection terminals.
- CNC-machined aluminum UMA flange.
- Separate protection grills.



Midranges

• The magnet pole yoke, designed with magnetic flux analysis software, helps to achieve perfect and homogeneous saturation of the magnetic gap for the benefit of the voice coil stroke. This reduces distortion and increases dynamics.

• A pure copper ring (9.4M) placed in the air gap helps reduce the inductance of the voice coil so that it offers minimal resistance during high frequency reproduction. This means better high-frequency response, enabling the speaker to reproduce high-frequency sounds more accurately. Reducing inductance contributes to better handling of rapid transitions of audio signals. This can improve the speaker's ability to more accurately reproduce transient sound pulses.

• TCA to control the flow of air moved by the cone creates aperiodic damping resistance and dictates that the release of energy accumulated in the movement of the speaker occurs in a controlled and fast manner, without creating persistent oscillations. This contributes to a more precise and faithful response to the audio source and to the accuracy and overall sound quality.

• Main twin coupled neodymium magnets (9.4M). This pair of neodymium high-temperature resistant magnets are one of the most powerful motor magnet structures for this size of car audio midrange. They are made from a high-grade neodymium and allow the size and bulk of the magnetic motors to be greatly reduced.

• Pole plate CNC machined from a solid piece of ultra-low-carbon steel.

• Die cast-aluminum and powder-coated basket offers very low resistance to the passage of air, and its shape (verified by FEM analysis) reduces vibration and resonance.

• Wide, lightweight Nomex voice coil with aluminum winding contributes significantly to the wide bandwidth extension.

• Large balanced Conex™ spider damper device ensures linear excursion in both directions, reducing distortion.

• The cone is made of high modulus carbon molded under vacuum and autoclave, a technology rarely used in speakers because of its cost, but brings enormous benefits in terms of naturalness of reproduction and high transient dynamics.

• The NBL rubber surround has a shape designed to ensure very smooth movement at very low excursion, becoming increasingly controlled as the excursion increases and approaches the limit.

• The laminated aluminum dust cap (9.4M) helps extend this midrange's frequency response upward, and its shape and size helps equalize and linearize the frequency response.

• CNC-machined aluminum grille (optional).

Woofer

• The pole cup, designed with magnetic flux analysis software, helps to achieve perfect and homogeneous saturation of the magnetic gap for the benefit of the voice coil stroke. Always immersed in constant magnetic flux, this reduces distortion and increases dynamics.

• Generously sized neodymium magnet: This very powerful magnet is made from a high-temperature resistant neodymium and allows the size and bulk of the magnetic motor to be greatly reduced. The equivalent magnetic force from a standard ferrite magnet would require larger dimensions of the speaker itself.

• Pole yoke with special internal ventilation, ensures a long life of the voice coil.

• The terminals accept large gauge cables and are gold-plated to prevent any loss of power generated by the amp.

• The cast-aluminum and powder-coated basket offers very low resistance to the passage of air, and its shape (verified by FEM analysis) reduces vibration and resonance.

• Conex™ spider damper is inside the voice coil with balanced and progressive stiffness for a perfect controlled ride.

• An enormous voice coil ensures highest-in-class power handling and guarantees unequaled speaker dynamics. The design of this voice coil ensures that it remains fully immersed in the magnetic field for much of its excursion, minimizing distortion. The voice coil former is made of aluminum with v entilation holes and black anodization in order to better dissipate heat. Underhung voice coil: the length of the voice coil winding is shorter than the height of the magnetic gap. This design allows lower distortion at lower excursions and more precise control over the movement of the voice coil.

• The cone is made of high modulus carbon molded under vacuum and autoclave, a technology rarely used in speakers because of its cost, but brings enormous benefits in terms of naturalness of reproduction and high transient dynamics.

• The NBL rubber surround has a shape designed to ensure very smooth movement at very low excursion, becoming increasingly controlled as the excursion increases and approaches the limit. This, too, helps to make this speaker extremely dynamic and capable of handling high powers.

• The CNC-machined aluminum ring secures the rubber suspension on the edge, ensuring perfect fastening and centering.

• CNC-machined aluminum grille (optional).

EISA AWARD Best Product 2024-2025
IN-CAR HIGH-END COMPONENT
ESB Novemila Series

In-Car High End Component

"The Novemila series by ESB pushes the boundaries of in-car speaker design far forward. A few but select speaker models for which every detail has been rethought and redesigned. Exclusive materials, state-of-the-art workmanship, elegant and functional design, excellent musicality... The entire ESB Novemila Series rewrites the paradigms of car speakers, with musical performance at the centre of a technologically advanced project and huge fashion Italian design."

The 9.1T-25 tweeter comes with 8 different mounting flanges for different car models. The back of the tweeter features a threaded hole to be used with each flange that greatly increases unconventional mounting options.

9.1T-25

1"/25 mm Dome Tweeter

Silk Dome Tweeter
N52H Neodymium Magnet
Super Light Aluminum Voice Coil
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 100 W / 200 W
Frequency Response: 1.6 KHz ~ 25 KHz
Sensitivity: 91.5 dB 2.83v/1m

9.1T-28 Ring

The 9.1T-28 tweeter can be installed with the optional gun metal anodized flange for spaces up to 95 mm. The flange is provided with a silver finishing ring fixed by magnets. The flange is equipped with a rear chamber which allows the tweeter an even better response in the lower frequency spectrum. (optional)

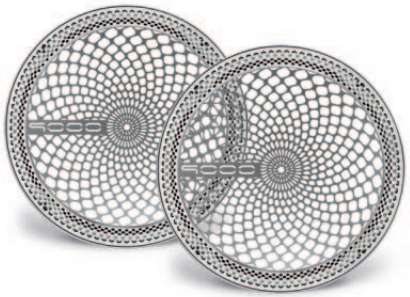
9.1T-28

1.1"/28 mm Dome Tweeter

Silk Dome Tweeter
N52H Neodymium Magnet
Super Light Aluminum Voice Coil
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 110 W / 220 W
Frequency Response: 1.4 KHz ~ 25 KHz
Sensitivity: 94.5 dB 2.83v/1m

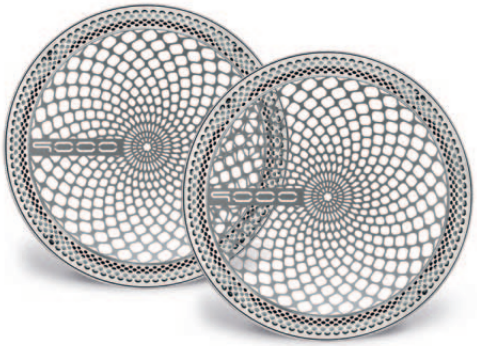
9.UMA

2-Way Mid-High Unit
(9.1T-25 + 9.3M)



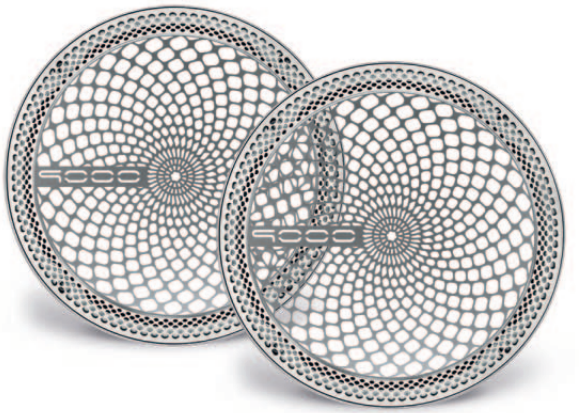
9.3M Grille

The 9.3M midrange can be installed with the optional CNC-machined Grille.



9.4M Grille

The 9.4M midrange can be installed with the optional CNC-machined Grille.



9.6W Grille

The 9.6W woofer can be installed with the optional CNC-machined Grille.

9.3M

3"/75 mm Cone Midrange

Carbon Fiber Cone, NBL Rubber Surround
Aluminum Alloy Basket
High-Grade Neodymium Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 110 W / 220 W
Frequency Response: 130 Hz ~ 20 KHz
Sensitivity: 91.5 dB 2.83v/1m

9.4M

4"/100 mm Cone Midrange

Carbon Fiber Cone, NBL Rubber Surround
Aluminum Alloy Basket
High-Grade Neodymium Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 120 W / 240 W
Frequency Response: 100 Hz ~ 20 KHz
Sensitivity: 90.6 dB 2.83v/1m

9.6W

6.5"/165 mm Mid-Woofer

Carbon Fiber Cone, NBL Rubber Surround
Aluminum Alloy Basket, Oversized Neodymium Magnet
75 mm Aluminum Voice Coil
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 180 W / 360 W
Frequency Response: 48 Hz ~ 5 KHz
Sensitivity: 91.5 dB 2.83v/1m


8000
DESIGNED AND ENGINEERED BY ESB - ITALY
8165
ESB
AUDIO
ESB

8000 Series

Elevated to Perfection

The 8000 Series can be considered the direct heir to the 7000 Series. The goal was to renew a variety of speakers in itself exceptional, with the help of the latest technologies and the use of the best materials available today, always with installation versatility in mind. Key to the development of this type of car speaker system was to build on their exceptional musicality. In the 8000 Series, every detail was treated with the utmost care, from the choice of materials, the forms, construction and finishing of the baskets, to the ventilation systems of the magnets and voice coils. We have improved what was thought to be difficult to improve and we strongly believe we have laid the foundation for a new series of exceptional car speakers.

THE GOAL WAS TO RENEW A VARIETY OF SPEAKERS IN ITSELF EXCEPTIONAL, WITH THE HELP OF THE LATEST TECHNOLOGIES AND THE USE OF THE BEST MATERIALS AVAILABLE TODAY.

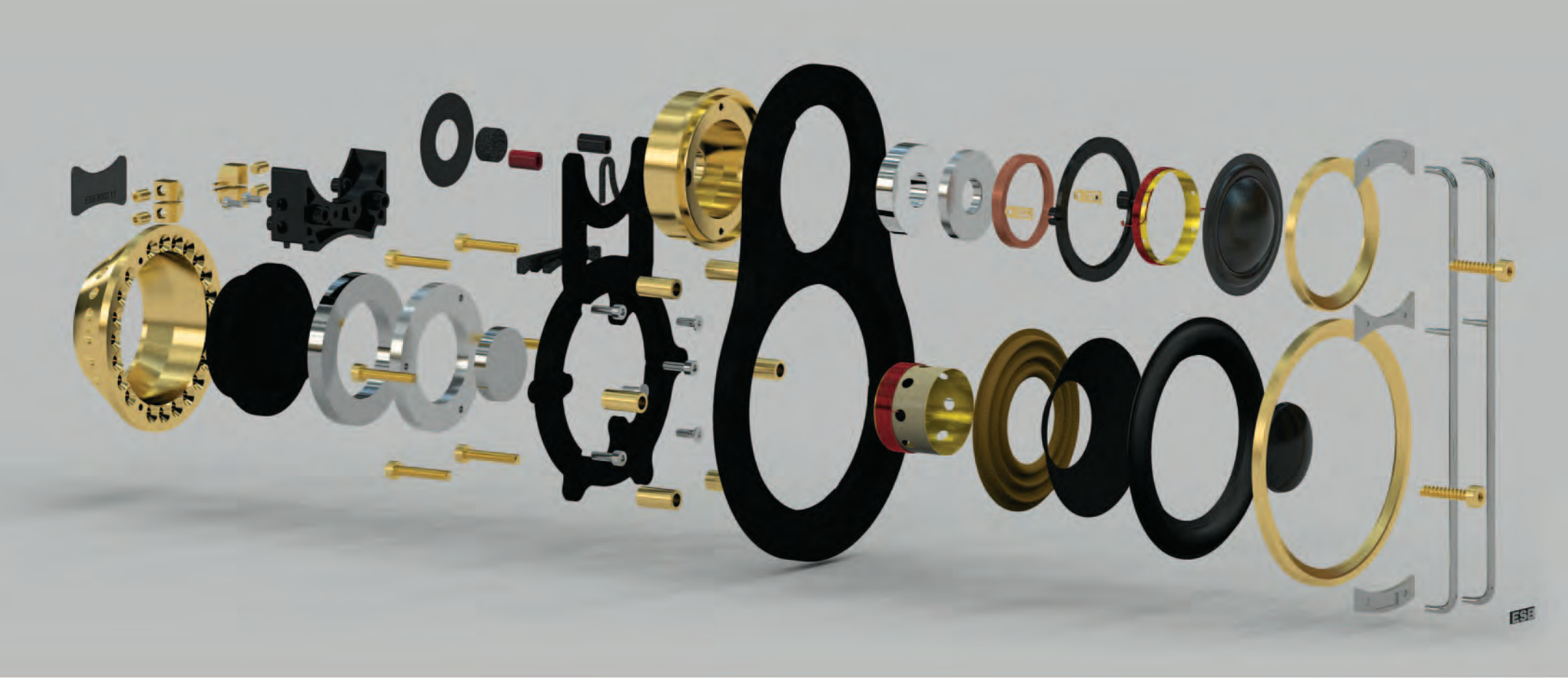
CONSTRUCTION TECHNOLOGIES

• Most of the parts are made of 7000 aluminum alloy and brass, manufactured entirely by numerical control (CNC). This makes the structure very rigid with practically zero tolerances, yielding consistency of performance and maximum linearity of reproduction, free from any vibration and/or resonance.

• The tweeter and the midrange use a O52 oversized, high quality neodymium magnet. This "motor" guarantees a perfectly linear response and constant magnetic flux over the entire working range, assuring an extremely linear and neutral response both at low and high volumes. Furthermore, a pure copper ring was added to reduce harmonic distortions.

• Torcon® soft dome (tweeter), an exclusive Polyphenylene Sulfide (PPS), with a high-performance fibers, offers superb heat resistance, low weight and excellent self-damping, resulting in a resonance-free frequency response over the audible frequency range.

• A careful study supported by FEM analysis allowed us to design the metal parts of the magnet to maximize the flow exactly around the voice coil, and make it linear throughout its entire excursion. Ventilation is ensured by a large opening on the bottom, protected by a filter with calibrated holes. This solution also reduces the peak impedance to the resonance frequency.



• The large 28 mm diameter voice coil (tweeter) is the best compromise between the lightness of the standard 25 mm coil and the great power management of 32 mm coils. This perfect combination of power and lightness is necessary for a tweeter that must reproduce frequencies in a linear and faithful way, even beyond the threshold of audibility. The voice coil uses an aluminum support to better disperse the temperature.

• Cone and dust cap (woofer) made from unpressed paper, yielding the best compromise between damping and rigidity for an extremely natural sound without colorations or alterations. A water repellent treatment also makes it suitable for applications in harsh environments.

• Oversized magnet (woofer). The high-quality magnet (Y-35) guarantees a surplus of energy that makes the excursion peaks easily reproducible by this woofer. Even at high excursions, the coil works quietly in its magnetic field.

• Basket made of 7000 aluminum alloy (woofer) manufactured entirely by numerical control (CNC). This makes the structure very rigid and with practically zero tolerances, yielding consistent performance and maximum energy transfer from the voice coil to the cone. Moreover, there's an increase in efficiency in the low range and absence of resonances in the medium/high range(only with Limited Edition Speakers).

• The large diameter voice coil (woofer) uses an aluminum support to better disperse the temperature. Furthermore, the entire voice coil is exposed to outside air through large slits in the basket (protected by a dust filter).

• The exclusively designed clamp accepts large gauge cables.

CROSSOVER NETWORK

Passive crossovers are used in 2-way and 3-way loudspeaker systems to electrically route low frequencies to the woofer and mid/high frequencies to midrange and tweeter. If a passive crossover is to work without compromise, it must be able to handle extreme dynamic variations, the full range of audio frequencies, complex speakers, and their varying impedance load. ESB 8000 passive crossovers are carefully designed to do this and to support the exact characteristics of ESB 8000 speakers.

Each crossover network circuit controls the signal to the high and low frequency speakers in order to maintain the linear acoustic response through the full audio spectrum. Naturally, such sophisticated engineering demands very close tolerances in production.

Ordinary passive crossovers, for example, often use electrolytic capacitors with tolerances of +/- 20% and metal core inductors. Response through the crossover region is ragged and characteristics vary from unit to unit.

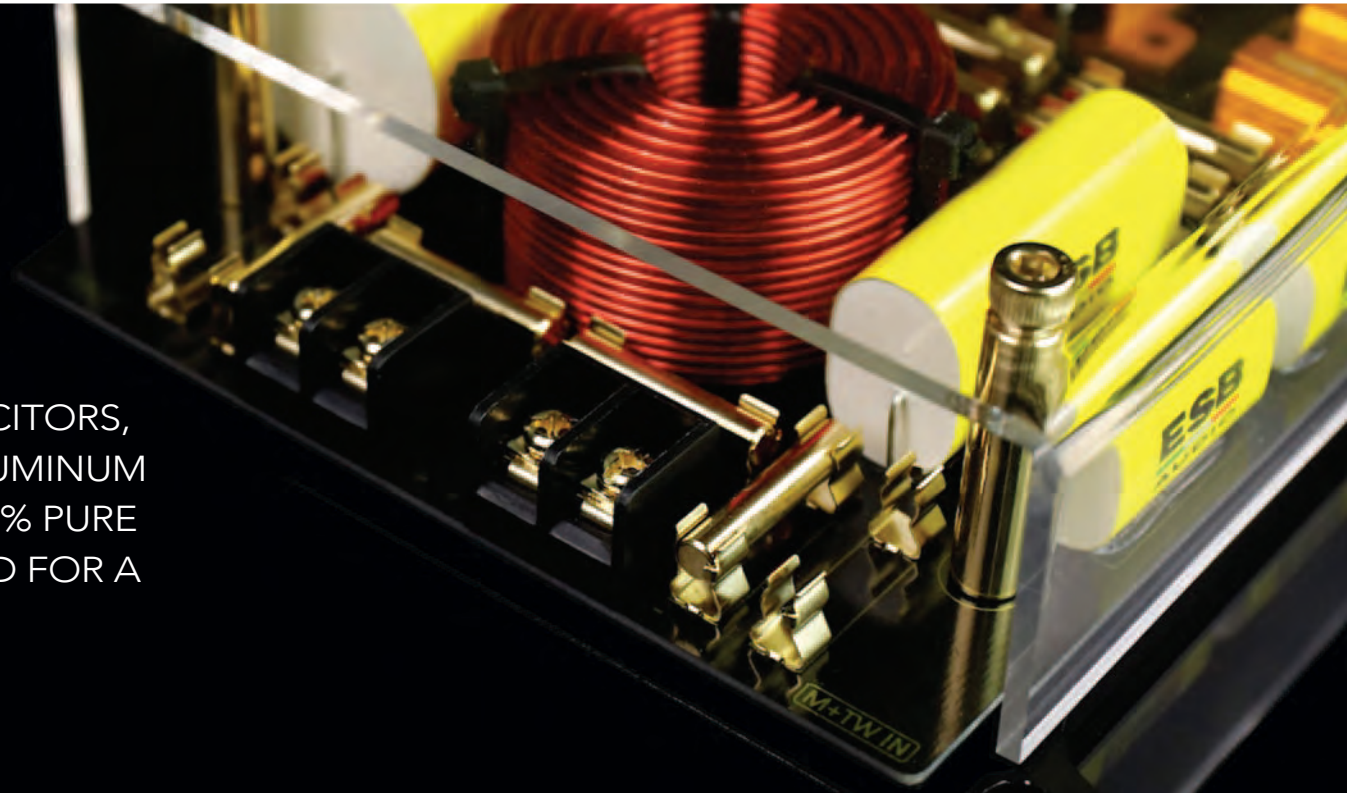
ESB's 8000 passive crossovers, on the other hand, use very high quality bi-metallized capacitors individually tested to meet ESB tolerances for maximum detailed transparency in the medium and high frequencies. To increase the response speed, the tweeter uses a configuration of lower value capacitors in parallel.

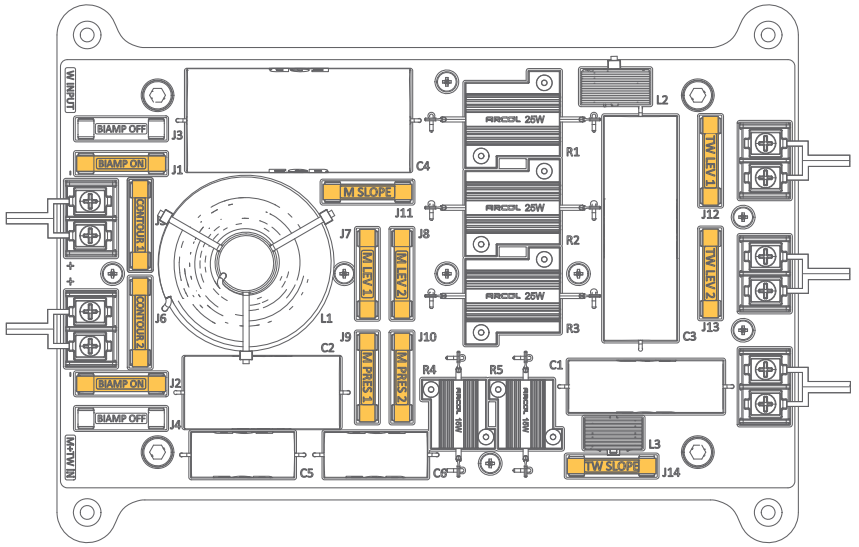
Anti-inductive resistors with dissipating aluminum body, helps to manage very high power in order to remain relatively cool. In this way, the resistance does not vary.

The special inductors used in ESB networks have extremely low insertion loss so that none of the driving power to the loudspeaker system is wasted in the network. To avoid interference between the inductors, these have been installed with a rotation of 90°. This arrangement cancels the interactions.

Air-wounded, large diameter (1.5mm), 99.9% pure copper coils minimize distortion.

HIGH QUALITY BI-METALLIZED CAPACITORS, ANTI-INDUCTIVE RESISTORS WITH ALUMINUM BODY, SPECIAL INDUCTORS AND 99.9% PURE COPPER COILS. CAREFULLY DESIGNED FOR A PERFECT AUDIO SIGNAL.





8000 Passive Crossover

These crossovers have been specifically designed for the 8000 series speaker systems, as below:

8.6K2CX
2-Way speaker systems with 8.165 woofer, 8028 tweeter

8.6K3CX
3-Way speaker system with 8.165 woofer, 8075 midrange, 8028 tweeter
3-Way speaker system with 8.165 woofer; 8.003UMA mid-hight unit

Removable Gold-Plated Jumpers

Our passive crossovers have been designed to allow tonal adjustments to the woofer, midrange (8.6K3CX only) and tweeter response, plus midrange (8.6K3CX only) and tweeter level, with gold-plated, removable jumpers. These adjustments make it possible to fine-tune the system to suit the users listening preferences and to compensate for different speaker mounting installations and orientations. For example, the listener can minimize or emphasize the mid frequencies of the woofer, depending on its distance from the midrange or tweeter, and adjust the emission level of the tweeter and midrange (in the 3-way crossover), as well as the cutting slope.

Best In-Car Speaker System

"Italian manufacturer ESB first developed its UMA - mid/high unit - several decades ago for both the hi-fi and car audio industries, and shows no sign of ending its commitment to the dual-driver concept. The 8.003UMA, of ESB's flagship 8000 Series, is the latest iteration, and places a 1.1" Torcon soft dome tweeter and 3" cellulose fibre-coned midrange within its single precision-machined enclosure. In addition to the elegant design, this speaker offers great sound, aided by excellent power handling and low distortion. Add the weight and drive of ESB's similarly stylish 6.5" woofer and you have a complete system of superior sonic ability and great value"

8.028

1.1"/28 mm Dome Tweeter

Torcon® Dome Tweeter - 28 mm Aluminum Voice Coil
High-Grade Neodymium Magnet - 7000 Aluminum Alloy Body
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 110 W / 220 W
Frequency Response: 940 Hz ~ 25 KHz
Sensitivity: 94 dB 2.83v/1m

8.028S

1.1"/28 mm Dome Tweeter

Torcon® Dome Tweeter - 28 mm Aluminum Voice Coil
High-Grade Neodymium Magnet - 7000 Aluminum Alloy Body
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 110 W / 220 W
Frequency Response: 940 Hz ~ 25 KHz
Sensitivity: 94 dB 2.83v/1m

8.003UMA

2-Way Mid-High Unit
(8.028 + 8.075)

8.075

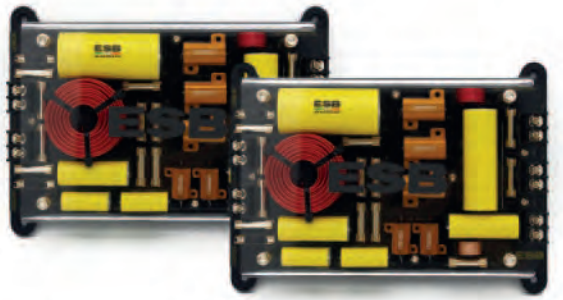
3"/75 mm Cone Midrange

NPPV™ Exponential Cone - Copper and Aluminum Voice Coil
Large Neodymium Magnet - 7000 Aluminum Alloy Body
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 120 W / 240 W
Frequency Response: 95 Hz ~ 16 KHz
Sensitivity: 95 dB 2.83v/1m

8.165

6.5"/165 mm Mid-Woofer

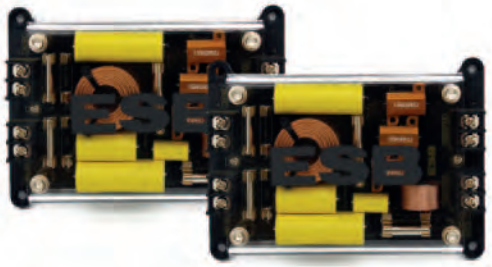
Non-Pressed Paper Cone - Y-35 Ferrite Oversized Magnet
Large Diameter Voice Coil
-
Nominal Impedance: 3 Ohm
Nominal / Transient Power: 160 W / 320 W
Frequency Response: 45 Hz ~ 4 KHz
Sensitivity: 92 dB 2.83v/1m



8.6K3 CX

3-Way Passive Crossover

High Quality Bi-Metallized Capacitors
Anti-Inductive Resistors with Aluminum Body
99.9% Pure Copper Coils
-
Multi-Amp. or Single Amplification Connection
4 Tweeter Attenuation Levels: 0; -2; -4; -6 dB
4 Midrange Attenuation Levels: 0; -3; -6; -9 dB
3 Midrange High-Pass Frequencies
2 Different Cutting Slopes for the Tweeter and Midrange
4 Levels of Adjustment for the Wf/Mid Transition Zone



8.6K2 CX

2-Way Passive Crossover

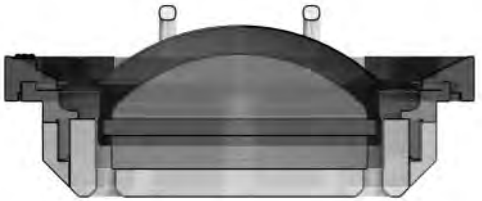
High Quality Bi-Metallized Capacitors
Anti-Inductive Resistors with Aluminum Body
99.9% Pure Copper Coils
-
Multi-Amp. or Single Amplification Connection
4 Tweeter Attenuation Levels: 0; -2; -4; -6 dB
2 Levels of Adjustment for the Wf/Tw Transition Zone


CINQUEMILA
ESB
ESB

5000 Series

Elegance and Technology, All Italian

The mission of this project was to create a loudspeaker system with an extremely high transient response (dynamic) in order to obtain music reproduction with a more realistic impact and involvement.
To achieve this, the main goal was to reduce the moving masses in order to make the mobile part of the loudspeaker lighter and faster in its movements, favoring the sudden variations of movement transmitted by the music from the amplifier.



Tweeter and Midrange

• The carbon fiber reinforced, polymer matrix composite dome ensures extraordinary rigidity combined with a very low weight.

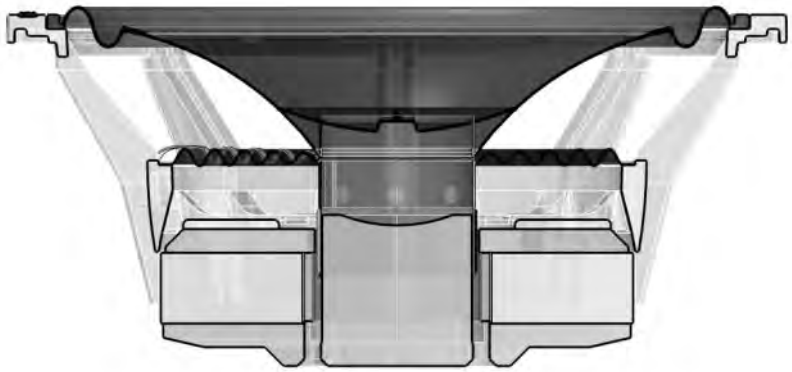
• The 28 mm (tweeter) and 50 mm (midrange) aluminum voice coil allow the use of very high power for this kind of component.

• The tweeter uses a very large, vented neodymium motor magnet optimized with computer simulations (FEA) to obtain a greater efficiency and improve linearity all along the voice coil's excursion.

• The tweeter's neodymium magnet is a high-grade type to reduce magnetic loss at elevated temperatures and concentrate more energy in a small space.
• All motor parts are made by the CNC process. This provides tighter tolerances and improved performance.

• Great attention was paid to the axial and radial ventilation of the moving coil to ensure high power handling, with reduced distortion, and increased durability. The axial ventilation holes reduce the compression of the air at the back of the dome resulting in much reduced distortion and extended response into lower frequencies.

• Residual resonances are neutralized by the under-dome, dB Cloth® damping material. This extends the frequency response to the lower limits and reduces harmonic distortion.



Woofer

• Great attention was paid to the axial and radial ventilation of the moving coil to ensure high power handling, reduced distortion, and increased durability. The stepped back allows a very long cone excursion.

• Metal parts machined from solid and refined material are CNC machined for maximum magnetic flux linearity, and minimum magnetic loss. This reduces distortion at high power levels.

• 25 mm CCAW (Copper Clad Aluminum Wire) double layer voice coil wound on an aluminum former provides exceptional power handling and compression-free reproduction to handle the most demanding musical passages.

• The carbon fiber reinforced, polymer matrix composite exponential cone ensures an extraordinary rigidity combined with very low weight.

• The eight twin-spoke, anti-resonant and self-extinguishing carbon fiber reinforced ABS frame ensures a drastic reduction of the cone's back reflections. The frame design assures high structural and torsional rigidity. This provides for perfect parts alignment and very tight construction tolerances.

• The exclusive ESB design of the TSW (Twin Symmetrical Wave) double-wave rubber suspension allows an excursion with perfect progression and linearity. This feature ensures natural low-frequency reproduction at low as well as at high volumes.

THE 8 TWIN-SPOKE, ANTI-RESONANT ABS FRAME, ENSURES A DRASTIC REDUCTION OF THE BACK REFLECTIONS. THE DESIGN ASSURES HIGH STRUCTURAL AND TORSIONAL RIGIDITY.

Passive Crossover

A passive crossover must be able to handle extreme variations in dynamics... the full range of audio frequencies, and the variable impedance of a loudspeaker load. ESB passive crossovers are carefully engineered to perfectly match the characteristics of the speakers they are designed for, so that they maintain uniform acoustic response across the entire audio spectrum. Such sophisticated engineering requires very tight manufacturing tolerances. Ordinary crossovers, for example, often use electrolytic capacitors with tolerances of +/- 20% and metal core on the inductors. The response is often incorrect and the characteristics may vary from unit to unit. All ESB crossovers, on the other hand, use only non-inductive polypropylene or mylar dielectric capacitors (not electrolytic), individually tested to meet ESB tolerances. The special inductors have extremely low loss so that the driving power of the speaker system is not lost in the network. A switch on the output side allows the listener to adjust the tweeter and midrange (5.6K3CX model) level according to the listener's distance. Both the input and output connections are made using strong two-way screw locking audio connectors. They accept cables up to 4.5 mm (6 AWG). The PCB uses thick copper tracks to limit signal loss.

The UMA Unit

This special and exclusive component driver is a concept born way back in the 70's. Its aim is to concentrate midrange and tweeter emissions in a single virtual point. This minimizes phase delays and irregularities at the crossover point.
Both components use a very large neodymium motor magnet optimized with computer simulations (FEA) to obtain greater efficiency and improve linearity all along the voice coil's excursion. Great attention was given to the ventilation of the two components through multiple axial ventilation holes. The high module carbon fiber domes offer superb heat resistance, low weight and excellent self-damping, with a natural and linear response and a very low frequency extension.
Combined together, the two components are able to reproduce, with perfect linearity, the entire spectrum from 500Hz to 25KHz.

5.028

1.1"/28 mm Dome Tweeter

Carbon Fiber Dome
Fixed Radius Hemispherical Dome Shape
Neodymium Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 110 W / 220 W
Frequency Response: 900 Hz ~ 25 KHz
Sensitivity: 94 dB 2.83v/1m

5.050

2"/50 mm Dome Midrange

Carbon Fiber Dome
Fixed Radius Hemispherical Dome Shape
Neodymium Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 120 W / 240 W
Frequency Response: 500 Hz ~ 6 KHz
Sensitivity: 94 dB 2.83v/1m

5.UMA

2-Way Mid-High Unit
(5.028 + 5.050)

5.165

6.5"/165 mm Mid-Woofer

Carbon Fiber Cone - Y-35 Ferrite Oversized Magnet
Large Diameter Voice Coil
-
Nominal Impedance: 3 Ohm
Nominal / Transient Power: 160 W / 320 W
Frequency Response: 50 Hz ~ 3.5 KHz
Sensitivity: 95 dB 2.83v/1m

5.6K3CX

3-Way Passive Crossover

Passive Crossover for 3-Way Systems
Polypropylene or Mylar Dielectric Capacitors
Oversized Non-Inductive Resistors
High Frequency Level: 0/-3 dB
Mid Frequency Level: 0/-2 dB

5.6K2CX

2-Way Passive Crossover

Passive Crossover for 2-Way Systems
Polypropylene or Mylar Dielectric Capacitors
Oversized Non-Inductive Resistors
High Frequency Level: 0/-2 dB

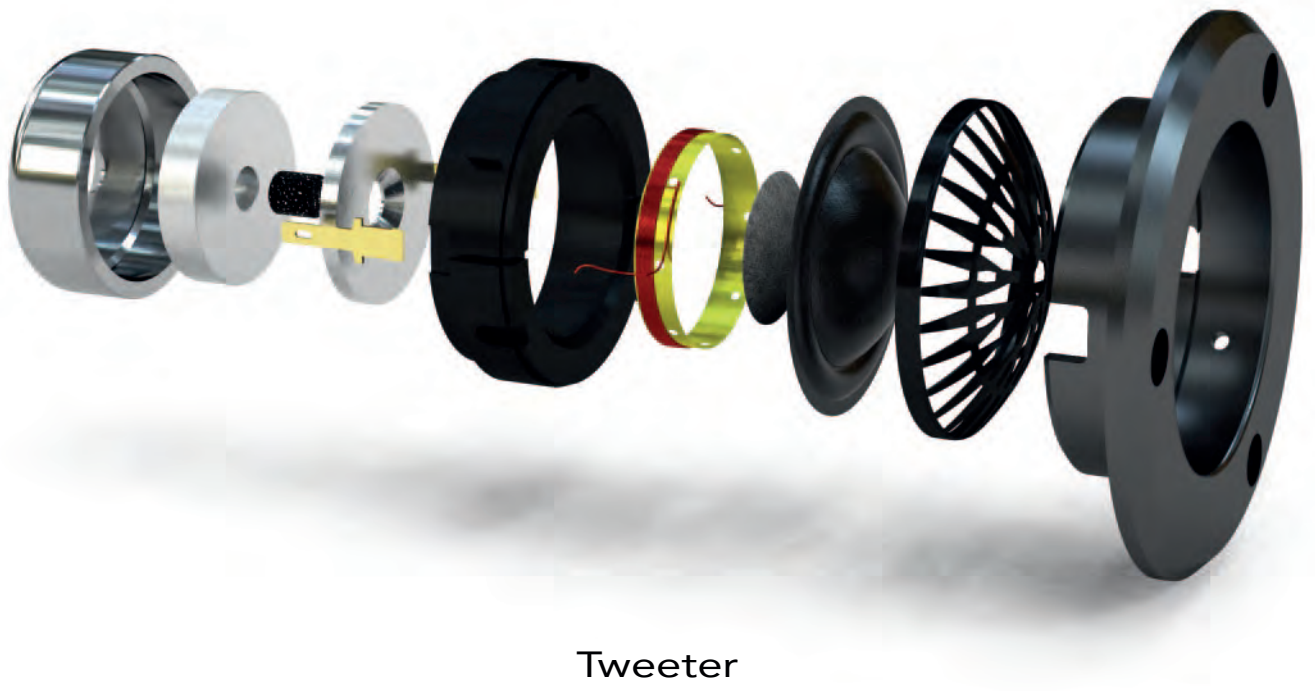

ESB


QUATTROMILA
ESB

4000 Series

Technology meets Performance

ESB's goal for its new 4000 Series was to push the limits of cost vs. performance. We know of no other car speakers currently on the market at these price points that make use of the same advanced materials or surpasses their remarkable performance. The particularly expensive design of the 3"/75 mm midrange driver and its high-grade, high-energy neodymium magnet guarantees a level of efficiency that supports high sound pressure levels even when paired with low-power factory amplifiers. Even the 4000 Series' premium matt black steel grilles lend them a more refined aesthetic on par with more expensive speaker systems. They make a bold statement, yet blend harmoniously with just about any car interior. With ESB's new 4000 Series, never has such quality, clarity, and accuracy been more affordable.



Tweeter

• Silk dome with polymer laminated (Sonatex™) creates a perfect balance between weight, rigidity, and self-damping. The catenary curvature ensures wide dispersion of the tweeter.

• Under dome felt damper improves acoustic phase by absorbing reflections from the magnetic structure that bounce through the dome.

• High-grade neodymium magnet. Not all magnets of equal size are equal in strength. This high grade (N-52), high-energy magnet provides a high resistance to demagnetization and is over 25% stronger for the same mass than more common lower grade (N-48) magnets. By utilizing a high-grade magnet, efficiency rises to extraordinary levels resulting in high output but controlled speaker.

• Main body in fiberglass-filled ABS for superior strength.

• Acoustic resistance component inside of the ventilation hole helps to control and dampen dome movement resulting in reduced distortion and a linear impedance curve for improved speaker/amplifier coupling.

• CNC-machined ultra-low carbon alloy steel pole plate. This type of manufacturing process ensures perfect flatness so it sits perfectly flush over the magnet without reducing any crucial magnetic flux.

• The large aluminum copper-clad vented voice coil can handle very high power while reproducing music with extreme realism and high dynamics. The copper clad aluminum wire voice coil is very lightweight and with excellent heat dissipation/capacity. Copper is coated over an aluminum surface providing equal copper surface area at a fraction of the weight of solid copper wire. The CCAC provides maximum sensitivity and extends the high frequency response of the speaker.

• Deluxe protective stainless-steel grille with perforations calibrated to function as an acoustic lens, guaranteeing the sound emission will be in the on-axis part of the speaker, and also curved to the sides, which is very useful in car installations where speaker placement often results in off-axis listening.

• CNC-machined aluminum alloy, flush mounted flange.

UMA Unit

A look inside

• Silk dome with polymer laminated (Sonatex™) creates a perfect balance between weight, rigidity, and self-damping. The catenary curvature ensures wide dispersion of the tweeter.

• High-grade neodymium magnet. Not all magnets of equal size are equal in strength. This high grade (N52), high-energy magnet provides a high resistance to demagnetization and is over 25% stronger for the same mass than more common lower grade magnets. By utilizing a high-grade magnet, efficiency rises to extraordinary levels resulting in a high output but controlled speaker.

• An acoustic resistance component inside of the ventilation hole helps to control and dampen dome movement resulting in reduced distortion and a linear impedance curve for improved speaker/amplifier coupling.

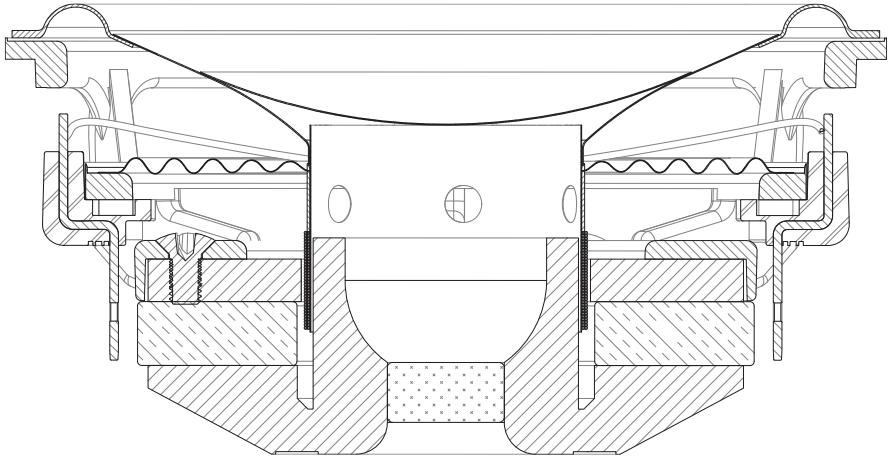
• Ultra-low carbon alloy steel pole piece CNC-machined magnet analysis software (FEM) to create a perfect geometry.

• Long-fiber, unbleached pulp cone (midrange) with a special external treatment that makes this material a perfect combination of lightness, rigidity, and internal damping. Discerning audiophiles consider pulp to be the best compromise for a speaker cone reproducing low and medium frequencies. The curvilinear-shaped cone improves this speaker's performance through their unique geometry. The sensitive inner section at the cone features a severe angle design that aids in its performance. The outer edge is flat and more rigid, producing louder mid-bass frequencies that radiates uniformly throughout the listening environment.

• The voice coil is designed to be extremely lightweight in order to easily reach the highest frequencies, but at the same time, remain durable enough to handle great power. The copper clad aluminum wire voice coil is very lightweight and with excellent heat dissipation/capacity. Copper is coated over an aluminum surface providing equal copper surface area at a fraction of the weight of solid copper wire.

• Injected ABS twin frame. This custom configuration is what has made ESB famous in the automobile audiophile world: the UMA unit ("Unità Medio Alta" in Italian). The extremely close positioning of the midrange and tweeter emission centers make these two components virtually one, facilitating installation in cars where space is tight and the separate position of these drivers would create quite a few phase problems.

• Deluxe protective stainless-steel grille with perforations calibrated to function as an acoustic lens, guaranteeing the sound emission will be in the on-axis part of the speaker.



Midrange

• Ultra-low carbon alloy steel pole piece CNC-machined using magnet analysis software (FEM), cold forged in one-piece creates a perfect geometry. This produces an extra magnet force concentration just in front of the voice coil, focusing the magnetic force where needed.

• High-grade neodymium magnet. Not all magnets of equal size are equal in strength. This high grade (N-52), high-energy magnet provides a high resistance to demagnetization and is over 25% stronger for the same mass than more common lower grade (N-48) magnets. By utilizing a high-grade magnet, efficiency rises to extraordinary levels resulting in high output but controlled speaker.

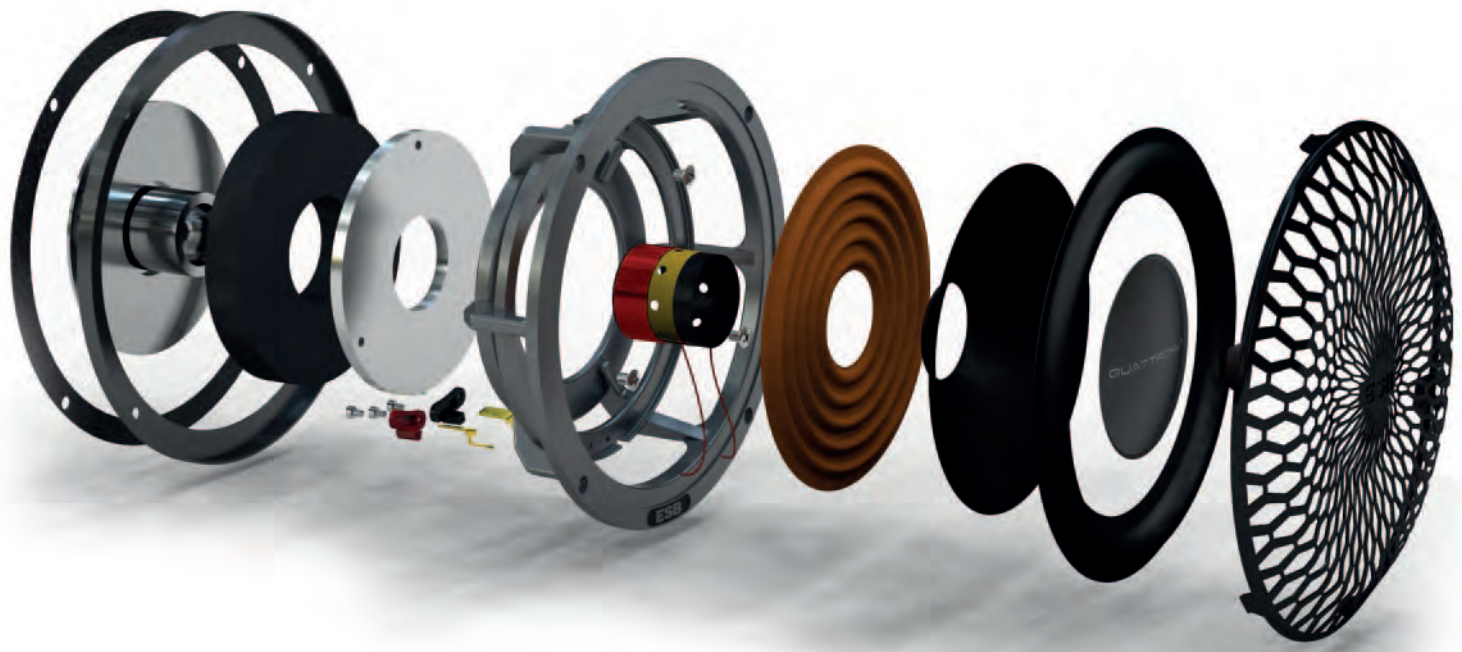
• Die cast aluminum alloy basket frame. This design structure offers great rigidity and minimal resistance to airflow movement without altering sound quality. The casting of this aluminum basket follows strict procedures that ensure compliance with regulatory specifications and help maintain consistent casting quality.

• CNC-machined ultra-low carbon alloy steel pole plate. This type of manufacturing process ensures perfect flatness so it sits perfectly flush over the magnet without reducing any crucial magnetic flux.

• The large aluminum copper-clad vented voice coil can handle very high power while reproducing music with extreme realism and high dynamics. The copper clad aluminum wire voice coil is very lightweight and with excellent heat dissipation/capacity. Copper is coated over an aluminum surface providing equal copper surface area at a fraction of the weight of solid copper wire. The CCAC provides maximum sensitivity and extends the high frequency response of the speaker.

• Long-fiber, unbleached pulp cone with a special external treatment that makes this material a perfect combination of lightness, rigidity, and internal damping.

• Surround suspension made of soft nitrile rubber, UV-resistant, and unaffected by temperature change so that the superior acoustic qualities of this speaker are preserved long-term. Special edge design ensures perfect and free forward and backward movement.



Woofer

• Ultra-low carbon alloy steel pole piece CNC-machined using magnet analysis software (FEM), cold forged in one-piece creates a perfect geometry. This produces an extra magnet force concentration just in front of the voice coil, focusing the magnetic force where needed.

• Oversized magnet. The high-quality magnet (Y-35) guarantees a surplus of energy that makes the excursion peaks easily reproducible by this woofer. Even at high excursions, the coil works quietly in its magnetic field.

• Die cast aluminum alloy basket frame. This design structure offers great rigidity and minimal resistance to airflow movement without altering sound quality. The casting of this aluminum basket follows strict procedures that ensure compliance with regulatory specifications and help maintain consistent casting quality.

• CNC-machined ultra-low carbon alloy steel pole plate. This type of manufacturing process ensures perfect flatness so it sits perfectly flush over the magnet without reducing any crucial magnetic flux.

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• Surround suspension made of soft nitrile rubber, UV-resistant, and unaffected by temperature change so that the superior acoustic qualities of this speaker are preserved long-term. Special edge design ensures perfect and free forward and backward movement.

CNC-Machined Aluminum Alloy,
Flush Mounted Flange
(included)

4.28

1.1"/28 mm Dome Tweeter

Sonatex Silk Dome
High-Grade N52 Neodymium Magnet
Extremely Lightweight Voice Coil
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 100 W / 200 W
Freq. Response: 1.5 KHz ~ 22 KHz
Sensitivity: 93.5 dB 2.83v/1m

Deluxe Protective Stainless-Steel Grille
(included)

4.75

3"/75 mm Cone Midrange

Long Fiber Paper Cone
Die Cast Aluminum Alloy Basket
High-Grade N52 Neodymium Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 100 W / 200 W
Frequency Response: 140 Hz ~ 12 KHz
Sensitivity: 90.6 dB 2.83v/1m

4.UMA

2-Way Mid-High Unit
(4.28 + 4.75)

4.165

6.5"/165 mm Mid-Woofer

Long-fiber, Unbleached Pulp Cone
Die Cast Aluminum Alloy Basket
Y35 Ferrite Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 150 W / 300 W
Frequency Response: 55 Hz ~ 6 KHz
Sensitivity: 92.5 dB 2.83v/1m

4.6C

6.5"/165 mm Coaxial Speaker

Silk Dome Tweeter, Long-fiber, Unbleached Pulp Cone
Die Cast Aluminum Alloy Basket
Y35 Ferrite Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 100 W / 200 W
Frequency Response: 55 Hz ~ 22 KHz
Sensitivity: 92.0 (Tw), 92.5 (Wf) dB 2.83v/1m

6.5" Grille

6.5"/165 mm CNC Grille

3000 Series

Research at the Highest Level

The ESB 3000 speaker system was developed and assembled with a great commitment to the research of materials and engineering solutions of the highest level.

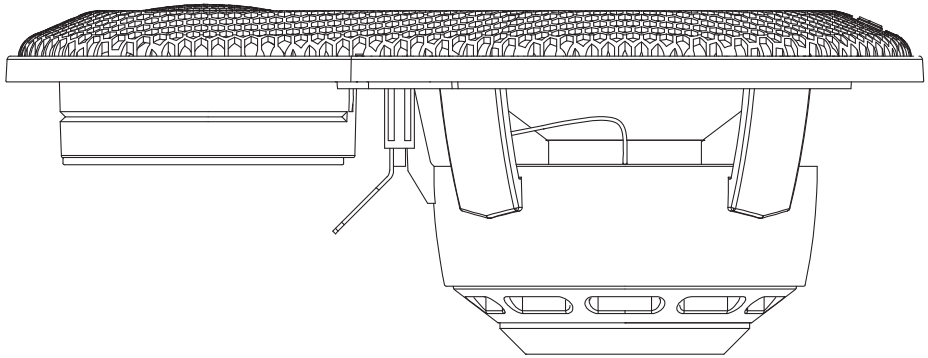
The baskets have been engineered to obtain maximum torsional rigidity (resistance to bending). The speaker cones use pressed paper with a water-proof treatment which represents an ideal marriage between lightness, stiffness and the ability of the cone to dampen any unwanted vibration.

All the woofers are equipped with a Y-35 grade ferrite magnet motor, having significantly higher performance than classic "standard" magnets.

The tweeters use a silk-impregnated, thin fabric dome diaphragm for a smooth sound, with oversized voice coils ventilated and damped with iron-fluid oil. They are supplied with accessories for flexible installation.

Woofer, Midrange and Widerange Cones

It is widely recognized that cones made of paper represent an ideal marriage between lightness, stiffness and the ability of the cone to dampen any unwanted vibration. Our paper cone, widely known for its excellent sound attributes, is made water-proof thanks to a polymer developed exclusively by ESB. The treatment does not negatively impact the appearance or performance of the speaker like the shiny polymers used by other companies. Our treatment protects the cone from dripping water (like inside a door panel), as well as accidental splashes on the front of the cone.



Basket and Ventilation System

The basket, made from ABS and reinforced with fiberglass, has been engineered to obtain the maximum torsional rigidity (resistance to bending), but at the same time, offers minimum resistance to the passage of air displaced by the cone from the rear face. The basket plays a fundamental role in aligning the coil in the magnetic circuit; its rigidity is crucial. Of equal importance is the damping of this component. The material used, in addition to being less sensitive to thermal changes, is non-flammable and also non-resonant. In addition, the ABS frame allows for a better clamping force torque than typical pressed steel frames and ensures that the voice coil remains well centered within the magnetic field.

Suspension

High Damping Single Wave Perbunan® rubber: The Perbunan® rubber surround is much more stable during temperature changes than standard rubber... its range of use extends from -20° F to + 100° F while maintaining its almost constant elasticity performance. Its profile ensures a dual function of high damping and great transversal stability. This means that the cone is limited to vertical movement only, eliminating the transversal movements that could cause contact with the voice coil and the magnet. As a result, these speakers can operate safely at high power and high excursions.

Centering

ESB's research department has spent a lot of time researching the ideal shape of the spider. This fundamental component must guarantee the perfect and linear travel of the cone at both low and high power, but must limit its excursion before becoming uncontrollable. The material is a special balanced cotton impregnated with phenolic resin that ensure a perfectly symmetrical excursion from the first mW of power, and then attenuates it when it reaches the value of Xmax. The design of this component ensures perfect ventilation of the voice coil, dissipating the heat from the lower part of the speaker, while at the same time, avoiding any counter-pressure from the cone's movement.

Voice Coil

The woofer voice coils use an aluminum support and a winding with a double layer of copper wire with an aluminum core. The long stroke design was chosen to improve sensitivity and efficiency while keeping distortion to a minimum.

The Magnetic Motor

All the woofers are equipped with a Y-35 grade ferrite magnet motor, a type of magnet with significantly higher performance than "standard" magnets. The motor's metal parts use low carbon steel and have been designed to obtain the maximum magnetic saturation.


DESIGNED AND ENGINEERED BY ESB - ITALY
DESIGNED AND ENGINEERED BY ESB - ITALY
3.6C 6.5"/165 mm COAXIAL SPEAKER
ESB

Convertible Speaker

The 3000 Series includes a "convertible" speaker, with a 6x9"/150x230 mm woofer, and a 1"/25 mm dome tweeter. By separating the tweeter from the woofer, it allows the system to transform from coaxial to a separate 2-way system.

ABS Phase Plug

When using the woofer in the "component" mode, the tweeter support is replaced by mounting an ABS phase plug on the pole piece. This detail is essential to focus the high frequency information in the center of the cone. The phase plug's innovative design ensures that the speaker response remains linear at mid-high and high frequencies. Its concavities are arranged on a very open angle which help to increase linearity even at accentuated listening angles. This is very important for the reproduction of the medium and medium-high range when the woofer is installed in the lower part of a car door.

3.69C

2-Way Convertible Speaker System

1"/25 mm Tweeter
6x9"/150x230 mm Woofer
2-Way Passive Crossover
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 120 W / 240 W
Frequency Response: 65 Hz ~ 25 KHz
Sensitivity: 92.0 (Tw), 91.5 (Wf) dB 2.83v/1m

3.69K2.5

2-Way Speaker System
(3.65 + 3.69)

2.5"/65 mm Widerange
6x9"/150x230 mm Woofer
-
Nominal Impedance: 4 Ohm
Frequency Response: 55 Hz ~ 22 KHz

3.6K3U

3-Way Speaker System with UMA
(3.UMA + 3.165)

2-Way Mid-High Unit
6.5"/165 mm Mid-Woofer
-
Nominal Impedance: 4 Ohm
Frequency Response: 65 Hz ~ 25 KHz
Optional Crossover: 3.6K3HE CX / 3.6K3 CX

3.6K3

3-Way Speaker System
(3.28 + 3.90 + 3.165)

1.1"/28 mm Tweeter
3.5"/90 mm Cone Midrange
6.5"/165 mm Mid-Woofer
-
Nominal Impedance: 4 Ohm
Frequency Response: 65 Hz ~ 25 KHz
Optional Crossover: 3.6K3HE CX / 3.6K3 CX

3.6K2

2-Way Speaker System
(3.28 + 3.165)

1.1"/28 mm Tweeter
6.5"/165 mm Mid-Woofer
-
Nominal Impedance: 4 Ohm
Frequency Response: 65 Hz ~ 25 KHz
Optional Crossover: 3.6K2 CX

3.25

1"/25 mm Tweeter

High Module Silk Dome
ABS Housing with Self-Damping System
N42H Neodymium Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 90 W / 180 W
Frequency Response: 1.2KHz ~ 25 KHz
Sensitivity: 92 dB 2.83v/1m

3.65

2.5"/65 mm Widerange

Paper Cone
ABS Basket with Self-Damping System
N42H Neodymium Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 60 W / 120 W
Frequency Response: 130 Hz ~ 22 KHz
Sensitivity: 86 dB 2.83v/1m

3.28

1.1"/28 mm Tweeter

High Module Silk Dome
ABS Housing with Self-Damping System
N42H Neodymium Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 90 W / 180 W
Frequency Response: 900 Hz ~ 25 KHz
Sensitivity: 94 dB 2.83v/1m

3.90

3.5"/90 mm Cone Midrange

Paper Cone
ABS Basket with Self-Damping System
N42H Neodymium Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 60 W / 120 W
Frequency Response: 150 Hz ~ 7 KHz
Sensitivity: 91.5 dB 2.83v/1m

3.UMA

2-Way Mid-High Unit
(3.25 + 3.65 Mid)

3.165

6.5"/165 mm Mid-Woofer

Paper Cone
ABS Basket with Self-Damping System
Y35 Ferrite Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 120 W / 240 W
Frequency Response: 65 Hz ~ 9 KHz
Sensitivity: 91.5 dB 2.83v/1m

The 3.6K3 HECX uses high-grade, separate **Alu E-Cap**, a high quality aluminum foil capacitor designed specifically for passive crossovers (tweeter and midrange drivers). It utilizes a much thinner dielectric insulation compared to the market standard. The use of a thinner dielectric insulator allows for a cap with less “memory“ and that is much faster reacting. Compared to the electrolytic capacitors, the Alu E-Cap brings more brightness and a little more natural top end balance to the audio system. Ideal for those who prefer a slightly brighter sounding system, while also hearing improvements in the overall naturalness/neutrality of the audio system.

3.6K3HE CX

3-Way High-End Passive Crossover

High-End Midrange Aluminum Capacitor
Oversized Ceramic Resistors
Polyester Tweeter Capacitor
4 Step Tweeter/Midrange Level Adjustment
Phase Tweeter/Midrange Adjustment

3.6C

6.5"/165 mm Coaxial Speaker

Paper Cone
ABS Basket with Self-Damping System
Y35 Ferrite Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 80 W / 160 W
Frequency Response: 65 Hz ~ 25 KHz
Sensitivity: 91.5 dB 2.83v/1m

3.69

6x9"/150x230 mm Woofer

Paper Cone
ABS Basket with Self-Damping System
Y35 Ferrite Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 120 W / 240 W
Frequency Response: 55 Hz ~ 9 KHz
Sensitivity: 91.5 dB 2.83v/1m

3.6K3 CX

3-Way Passive Crossover

3.6K2 CX

2-Way Passive Crossover

Oversized Ceramic Resistors
Polyester Tweeter Capacitor
4 Step Tweeter Level Adjustment
Phase Tweeter/Midrange Adjustment (3.6K3 CX)

SUBWOOFERS

• Motor made of very low carbon steel for the highest magnetic permeability, resulting in a greater magnetic flux on the voice coil.

• Processing of the plates with computer numerical control machines (CNC) to decrease tolerance and increase the quality's efficiency and consistency.

• Y30 grade ferrite magnets: a high-level material normally reserved for higher priced products.

• Motor design optimized to reduce the eddy currents generated by the movement of the voice coil. This design dramatically decreases distortion.

• Kapton® voice coil support: a synthetic material originally used in outer space applications for its ability to withstand very high temperatures without deforming, and for having a very low mass.

• Voice coil wound on 4 layers of copper wire providing an extra-long stroke.

• Conex® spider: a semi-synthetic material that maintains an excellent constancy of elasticity over time yielding optimal performance even after years of intense use.

• Steel basket, but shaped to obtain a rigidity equal to aluminum.

• An additional internal stiffening ring connects the spider directly to the motor. This prevents unwanted vibrations from reaching the cone through the basket.

• Treated cellulose pulp cone provides excellent damping for deep, detailed bass.

Enclosures

To maximize the performance of this subwoofer we highly recommend using a dedicated enclosure. Inside the datasheet are specifications and two recommended enclosures: one is a sealed enclosure (with only 16 lt of volume); the other is a ported design (with 28 lt of volume). Both types of enclosures will give excellent sound quality and low-frequency extension. The sealed enclosure is a better choice if space is extremely tight, while the ported enclosure will produce 3 dB more output with the same power if there is extra space to work with.

3.10D4

10"/250 mm DVC 4+4Ω Subwoofer

4-Layers DVC with Kapton® Support
High-Grade Y30 Ferrite Magnet
Conex® spider, Long Travel Surround
Treated Cellulose Pulp Cone
-
Nominal Impedance: 4+4 Ohm
Nominal / Transient Power: 300 W / 600 W
Sensitivity: 91 dB 2.83v/1m

3.10D2

10"/250 mm DVC 2+2Ω Subwoofer

4-Layers DVC with Kapton® Support
High-Grade Y30 Ferrite Magnet
Conex® spider, Long Travel Surround
Treated Cellulose Pulp Cone
-
Nominal Impedance: 2+2 Ohm
Nominal / Transient Power: 300 W / 600 W
Sensitivity: 92 dB 2.83v/1m

ESB presents a new, active, ported subwoofer with extremely compact dimensions without sacrificing the power required by this speaker. The 3.WB8 uses a new construction technology, where is possible to use a very low impedance and high efficiency speaker (ideal for electric machines), an amplifier without the switching power supply stage (therefore less noise) and a higher power in a small space.

- Easy Installation, Ultra-Compact size (only 15 cm dept).
- High-Current Class D digital amplifier
- Variable Gain Control, Low Pass Filter (50 Hz ~ 200 Hz), Bass Boost (0 ~ 12dB), Phase Control (0° ~ 180°)
- Auto Power-ON (Rem, DC Offset, Auto)
- Wireless remote control included
- Enclosure Housing Material: MDF

3.WB8

8"/200 mm Active Ported Subwoofer

Ultra-Compact Design (Only 15 cm Deep)
Built-In 600 W High Current Class-D Amplifier
Fiberglass/Paper Cone, Ferrite Magnet
0.25 Ohm Speaker
-
Nominal / Transient Power: 300 W / 600 W
Dimensions (mm): 448(W) x 289(H) x 150(D)
Weight: 9.0 Kg

2000 Series

A Reference Product for Your Category

The 2000 Series include advanced technologies for car speaker to accurately reproduce music in the car. All the knowledge and experience of ESB's R&D has been transferred to these special components to obtain maximum audio performance as it relates to bandwidth, dynamics in music response, higher fidelity, and more detailed sound.
A reference product for your car audio category.

Tweeter

The 2000 Series tweeters use a silk-impregnated, thin fabric dome diaphragm for a smooth sound, with an outer suspension of the same material, but covered in a high-loss damping material to eliminate edge vibration and esonance. The dome is of extremely low mass and is much less susceptible to mechanical deformation than other tweeters, yet provides a smooth, linear and very extended response. The large diameter voice coil has an aluminum support and very light copper-coated aluminum wire, ventilated and damped with iron-fluid oil and with anti-resonance chambers. The special ventilation design, called SVS (Surround Vented System), provides optimal cooling to handle high power and avoid compressing the air at the back of the dome, resulting in significantly lower distortion. The high-grade, N42H neodymium magnet, is optimized with computer simulations for better efficiency and improved linearity, ensuring better power management and increased bandwidth and efficiency.

Woofer

The basket, made from ABS and reinforced with fiberglass, has been engineered to obtain the maximum torsional rigidity (resistance to bending), but at the same time, offering minimum resistance to the passage of air displaced by the cone from the rear face. The ABS frame also allows for a better clamping force torque than typical pressed steel frames and ensures that the voice coil remains well centered within the magnetic field. The paper cone is the ideal marriage between lightness, stiffness and the ability of the cone to dampen any unwanted vibration (read: distortion). The waterproof treatment does not negatively impact the appearance or performance of the speaker. Our treatment protects the cone from dripping water, as well as accidental splashes on the front of the cone. The woofer voice coil uses an aluminum support and a winding with a double layer technology of copper wire with an aluminum core. The long stroke design was chosen to improve sensitivity and efficiency while keeping distortion to a minimum. The woofer is equipped with a grade Y-35 ferrite magnet motor, a type of magnet with significantly higher performance than "standard" magnets. The metal parts of the motor use low carbon steel and have been designed to obtain the maximum magnetic saturation.

2.6K2XP

2-Way Speaker System

1.1"/28 mm Tweeter
12 dB In-Line Tweeter Crossover
6.5"/165 mm Mid-Woofer
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 90 / 180 (Tw), 120 / 240 (Wf) W
Frequency Response: 65 Hz ~ 25 KHz
Sensitivity: 94 (Tw), 91.5 (Wf) dB 2.83v/1m

2.6K2X

2-Way Speaker System

1"/25 mm Tweeter
12 dB In-Line Tweeter Crossover
6.5"/165 mm Mid-Woofer
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 80 / 160 (Tw), 120 / 240 (Wf) W
Frequency Response: 65 Hz ~ 25 KHz
Sensitivity: 92 (Tw), 91.5 (Wf) dB 2.83v/1m

2.6C

6.5"/165 mm Coaxial Speaker

Paper Cone
ABS Basket with Self-Damping System
Y35 Ferrite Magnet
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 80 W / 160 W
Frequency Response: 65 Hz ~ 20 KHz
Sensitivity: 91.5 dB 2.83v/1m


ESB
MILLE
1.6W 6.5"/165 MM MIDBASS
1000MILLE
DESIGNED AND PRODUCED BY ESB

1000 Series

Performance

The 1000 Series was conceived and designed to offer ESB sound in low-cost speakers, without sacrificing quality. The woofer's pressed paper cone, the large voice coils for handling high power, and the silk dome tweeters with neodymium magnets, are just some of the features that make these speakers uncompromising.
Each system is designed to be easily installed in a vehicle's original speaker housings and to be integrated with factory head unit or an aftermarket amplifier, whether a vehicle uses coaxial components or two-way speaker systems. Particular attention was given to the mounting depth, which at just 59 mm, is among the shallowest on the market today.
Great sound for every day use.

As always, in the ESB philosophy, extreme attention has been given to the musical result. Although these are first-rate speakers, they maintain sonic coherence with the rest of our higher range products without overshadowing our deliberate engineering choices. Those choices guarantee optimal ventilation for safe power management, and materials carefully chosen for their undisputed acoustic qualities. The ESB 1000 woofer in the 2-way systems uses the classic cone configuration with a 25 mm (1") diameter voice coil and a cone in a special cellulose fiber treated on the external side. The tweeter is a 25 mm (1”) diameter soft dome which uses a coil external to the dome in order to guarantee maximum response speed (dynamic).

Basket

The woofer basket is designed with an open, aerodynamically efficient design to optimize ventilation and decompression, allowing sound waves to flow smoothly. Its shape eliminates interference with the moving components of the woofer allowing the use of a low-profile spider for greater support and stability at high excursions as well as a large fixing surface to the magnet. This guarantees rigidity even at high powers. A special anti-resonant paint cancels vibrations and resonances from the basket.

Motor

ESB's experience in designing magnetic motors results in the energy produced by the motor to be used extremely effectively. The magnetic motor system (which uses a high-grade ferrite magnet) has been designed to achieve precise balance between size, weight and magnetic flux, to optimize the electro-magnetic characteristics of each speaker.

Voice Coil

The use of aluminum for the moving coil support, although rather expensive, offers many advantages compared to classic voice coils. First of all, it provides greater thermal dissipation (20% higher), and secondly; it supports greater extension of the medium and high frequencies of the woofer which guarantees an "open" sound, making the listening experience pleasant and natural.

Centering

ESB's research department has spent a lot of time researching the ideal shape of the spider. This fundamental component must guarantee the perfect and linear travel of the cone at both low and high power, but must limit its excursion before becoming uncontrollable. The design of this component ensures perfect ventilation of the voice coil, dissipating the heat from the lower part of the speaker, while at the same time, avoiding any counter-pressure from the cone’s movement.

Tweeter

The tweeter design sets new standards for power handling and low distortion while delivering enjoyable music reproduction. The 1000 Series tweeters use a silk dome for a smooth and natural sound. The dome is of extremely low mass and is much less susceptible to mechanical deformation. It provides a smooth, linear and very extended response. The high-grade neodymium magnet is optimized to provide better efficiency and improved linearity, ensuring greater power management with increased bandwidth and efficiency. Different mounting options make installation simple and hassle-free. Furthermore, the tweeter can be removed from its housing to further reduce its size for installation in a vehicle's original housing.

Cone and Surround

Cones made of paper are the ideal marriage between lightness, stiffness and the ability of the cone to dampen any unwanted vibration. The rubber surround ensures high damping and transversal stability, eliminating movements that could cause contact with the voice coil and the magnet. The surround plays an important role in defining the linearity and stability of the cone/voice coil assembly. A great effort has been made to carefully design its geometry and flexibility, using high-quality materials to ensure precision and linearity in the cone movement, thus reducing distortion and increasing bass dynamics.

Dust Cap

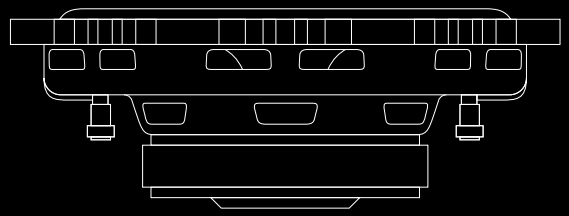
A new dust cap made of damping material helps reduce cone break-up at high volume levels, thus expanding the range of use of the woofer at high power.

Crossover

The crossover filter is built to handle higher power than the speakers by using high-quality components. This minimizes component saturation that could cause the speakers to distort, allowing the ESB 1000 System to deliver its full potential.

SUBWOOFER

More bass with less space! The ESB 1.10SD subwoofers has been designed to achieve exceptional performance in an ultra-compact design that fits any application. Thanks to a cutting-edge design combined with engineering innovations that allow for an ultra-slim profile, ESB delivers the best bass without compromising performance and quality. The unique motor structure, combined with a powerful 40.5 Oz ferrite magnet, allows for 500 Watts of maximum power. The polystyrene cone with a long throw rubber surround, ensures the best bass performance. The subwoofer is optimized to work in sealed boxes of about 21 Lt.



Only 9,5 cm of Depth

1.6K2X

2-Way Speaker System

1"/25 mm Tweeter
12 dB In-Line Tweeter Crossover
6.5"/165 mm Mid-Woofer
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 90 W / 180 W
Frequency Response: 50 Hz ~ 21 KHz
Sensitivity: 92 dB 2.83v/1m

HB1.6C

6.5"/165 mm Coaxial Speaker

0.8"/20 mm Tweeter
6.5"/165 mm Mid-Woofer
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 90 W / 180 W
Frequency Response: 50 Hz ~ 20 KHz
Sensitivity: 91 dB 2.83v/1m

Enclosures

To maximize the performance of this subwoofer we highly recommend using a dedicated enclosure. Inside the datasheet are specifications for a sealed enclosure (with 22 lt of volume).

1.10SD4

10"/250 mm DVC 4+4Ω Subwoofer

1.10SD2

10"/250 mm DVC 2+2Ω Subwoofer

Over-sized dual voice coil
Ferrite magnet with ventilation hole
Steel basket
Non-pressed paper cone
Long travel foam surround
-
Nominal / Transient Power: 250 W / 500 W
Sensitivity: 93 (SD4), 96 (SD2) dB 2.83v/1m

Demo Boxes

An effective Sales Tool for your Business

There's no better way to demonstrate the sound quality of a speaker than to have it play inside a cabinet. ESB's demo speaker enclosures make extensive use of CAD (Computer-Aided Design) to effectively brace and strengthen each enclosure, such that every millimeter of movement from the speakers is directed towards the listener, so sound is not wasted as vibration.

Gold-plated, brass conic feet guarantee minimum surface contact with the environment, thus minimizing the transfer of unwanted vibrations. ESB loudspeakers have excellent off-axis response and dispersion. Positioning them in any environment will result in an excellent listening experience. If your showroom does not have a bookshelf or a plane surface, we supply a support base (stand) that places them at the correct height and listening angle.

ESB's enclosures do not include speakers and/or passive crossovers.

8000

8.PB

2-Way Bookshelf Piano Box

Black lacquered, compatibile with:
8.165 / 8.165 LE: 6.5"/165 mm Mid-Woofer
8.028S: 1.1"/28 mm Dome Tweeter

8.SB

8.PB Bookshelf Stand

8.TB

3-Way Piano Tower

Made for 8000 Series. Compatibile with:
8.165 / 8.165 LE: 6.5"/165 mm Mid-Woofer
8003.UMA: 2-Way Mid-High Unit

5000

5.PB

2-Way Bookshelf Piano Box

Dark gray lacquered, compatibile with:
5.165: 6.5"/165 mm Mid-Woofer
5.028: 1.1"/28 mm Dome Tweeter

3000 / 2000

2.PB

2-Way Bookshelf Piano Box

White lacquered, compatibile with:
3.165 / 2.165 II: 6.5"/165 mm Mid-Woofer
3.28 / 2.28: 1.1"/28 mm Dome Tweeter

2.SB

2.PB Bookshelf Stand

2.PB enclosure can be adapted for
the new 3000 and 2000 Series

The photos shown here are illustrative only.
All our boxes are supplied without speakers and crossovers.


CS-W81
ESB
AUDIO


ESB | AUDIO
Q3
TFSI

CAR SPECIAL

Get the Best Sound
Replacing your original car speakers

All of our Special Car speakers differ from our “standard” ESB Car Audio speakers... different not just for sizes and dimensions, but also for the technology used to match limited cockpit spaces and low power factory amplifiers. They boast high grade neodymium magnets, lighter cones, lighter, rigid aluminum baskets, and a new voice coil complex. Each model has a dedicated adapter to exactly match the space requirement and mounting holes of each vehicle model. All the speaker connections are plug and play with the original factory wiring. speakers are then equalized for each specific car's environment with an individually designed crossover.

THE FIRST IN OUR SPECIAL CAR SPEAKER SERIES WERE DESIGNED FOR AUDI VEHICLES. THE ESB TEAM'S CHALLENGE WAS TO MATCH AUDI'S UNIQUE SPEAKER HOUSINGS AND AMP POWER.

AUDI SPECIAL SPEAKERS

The first in our Special Car Speaker Series, a new project, were designed for Audi vehicles… the Audi A4, Audi A6 and Audi Q5. The ESB team's challenge was match Audi's unique speaker housings and original amplifier power (which was too low to properly drive high-quality speakers). It was not possible to replace the amplifier integrated in Audi's entertainment system with our own. Our challenge was to develop new, higher quality speakers with equal or better efficiency than the originals. The depth of the speaker housings was also very limited (only a few centimeters). It was impossible to adapt cone speakers to traditional voice coils and magnets. So, we developed all new speakers (in the 8" and 6.5" sizes) with neodymium magnets and special voice coil.

The model numbers of these new speakers are ESB CS-W81 and ESB CS-W61 (they can also be used in other cars). These speakers have a shallow depth and can be used with special adapters (in an elegant aluminum Ferrari red color) to match car spaces exactly. Also, the connectors match the car's original wire connectors for ultimate plug and play convenience. For the 8" and 6.5" Audi speakers, we developed two new tweeters, the 1.2" ESB CS-T31 and the 1" ESB CS-T21. These tweeters can also be used in other cars. The speakers included in our Car Kits have different model numbers because they include the adapters. Thus, the ESB CS-W81 becomes the ESB A6-F81 for the front of the Audi A6, and ESB A4-F81 for the front of the Audi A4 and Audi Q5. The same for applies to our other Audi speakers.

System Parts

A6-F81: The A6-F81 uses the ESB CS-W81 8"/20 cm component woofer, with special adaptor to fit the Audi A6 +original woofer housing in the front seats.
A6-FTW1: The A6-FTW1 uses the ESB CS-T31 1.2"/3.2 cm component tweeter, with special adaptor to fit the Audi A6 original tweeter housing in the front seats.
A6-FTW1-C1: ESB A6-FTW1 dedicated crossover.

A6 FRONT 200

Front Speaker System for Audi A6

1.2"/32 mm Tweeter
8"/200 mm Woofer
Dedicated Crossover
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 80 / 160 (Tw), 120 / 240 (Wf) W
Frequency Response: 40 Hz ~ 25 KHz
Sensitivity: 92 (Tw), 91.5 (Wf) dB 2.83v/1m

System Parts

A4-F81: The A4-F81 uses the ESB CS-W81 8"/20 cm component woofer, with special adaptor to fit the Audi A4/Q5 original woofer housing in the front seats.
A4-FTW1: The A4-FTW1 uses the ESB CS-T31 1.2"/3.2 cm component tweeter, with special adaptor to fit the Audi A4/Q5 original tweeter housing in the front seats.
A4/Q5-FTW1-C1: ESB A4-FTW1 dedicated crossover.

A4/Q5 FRONT 200

Front Speaker System for Audi A4/Q5

1.2"/32 mm Tweeter
8"/200 mm Woofer
Dedicated Crossover
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 80 / 160 (Tw), 120 / 240 (Wf) W
Frequency Response: 40 Hz ~ 25 KHz
Sensitivity: 92 (Tw), 91.5 (Wf) dB 2.83v/1m

System Parts

A6/A4-R61: The A-R61 uses the ESB CS-W61 6.5"/16.5 cm component woofer, with special adaptor to fit the Audi A4/Q5 original woofer housing in the rear seats.
A6/A4-RTW1: The A-RTW1 uses the ESB CS-T21 1"/2.5 cm component tweeter, with special adaptor to fit the Audi A4/Q5 original tweeter housing in the rear seats.
A6/A4-RTW1-C1: ESB A-RTW1 dedicated crossover.

A6/A4/Q5 REAR 165

Rear Speaker System for Audi A6/A4/Q5

1"/25 mm Tweeter
6.5"/165 mm Mid-Woofer
Dedicated Crossover
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 60 / 120 (Tw), 115 / 230 (Wf) W
Frequency Response: 65 Hz ~ 25 KHz
Sensitivity: 95 (Tw), 94 (Wf) dB 2.83v/1m


ESB


ESB MODEL HR 11SW
REMOTE
PRT
PWR
L R- L- R
L+ R+ L+ R+
ACC
GND GND +12V +12V
GND GND +12V +12V
LOW-IN
HIGH-IN
FUSE


HARMONY

HARMONY Series

Back from the 80s

The Harmony brand was launched in the 1980s, together with the first home loudspeakers produced by ESB. The production of Harmony car speakers began in the 90s, with a wide range of products that combined high quality performance at a lower price than the ESB speakers themselves, yet without ever forgetting the final goal... high-fidelity speaker capable of reproducing the entire sound spectrum.
Now ESB returns with the Harmony Series, offering all you need in convenient ready-to-use speaker systems, including active subwoofers that can be easily installed under the front seats or that fits inside the rim of your spare wheel.

HB1.6K2X

2-Way Speaker System

1"/25 mm Tweeter
12 dB In-Line Tweeter Crossover
6.5"/165 mm Mid-Woofer
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 65 W / 130 W
Frequency Response: 65 Hz ~ 20 KHz
Sensitivity: 92 dB 2.83v/1m

HB1.6C

6.5"/165 mm Coaxial Speaker

0.55"/14 mm Tweeter
6.5"/165 mm Mid-Woofer
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 50 W / 100 W
Frequency Response: 65 Hz ~ 18 KHz
Sensitivity: 91 dB 2.83v/1m

HB1.10S4

10"/250 mm Subwoofer

Single Voice Coil, Ferrite Magnet
Steel Basket, Non-Pressed Paper Cone
Long Travel Surround
-
Nominal Impedance: 4 Ohm
Nominal / Transient Power: 200 W / 400 W
Sensitivity: 91 dB 2.83v/1m
Sealed Enclosure: 28 Lt (recommended)

We have improved acoustic quality and reliability to provide a “ready-to-use” amplified subwoofer that can be easily installed under the front seats. The control panel lets you to set Input Gain, LP Filter, Bass Boost, and Phase of this sub. The Low and High-Level Inputs guarantee maximum installation flexibility.

HR 10 US

10"/250 mm Underseat Active Subwoofer

Class AB Amplifier, Low/High Level Inputs
Gain Control, LP Filter, Bass Boost, Phase Control
Auto Power-ON, Wired Remote Control
Aluminum Housing
-
Nominal / Transient Power: 130 W / 260 W
Frequency Response: 10 Hz ~ 150 Hz
Size: 26 (L) x 34,6 (W) x 7,8 (H) cm

made for android

The HR 10 US-A is an Active Subwoofer for Android audio systems that includes a 280 (4x70) W max 4-ch. amplifier, plus a 400 W max amplified subwoofer in an aluminum case, including Android Plug&Play connection cable. An entire audio system capable of significantly increasing the power of the car's original system.

HR 10 US-A

10"/250 mm Underseat Active Subwoofer for Android

Class AB Amplifier, Gain Control
LP Filter, Bass Boost, Phase Control
Auto Power-ON, Wired Remote Control
Aluminum Housing
-
Nominal Power: 4 x 35 W + 1 x 200 W
Transient Power: 4 x 70 W + 1 x 400 W
Size: 24,5 (L) x 34,5 (W) x 7,8 (H) cm

The HR 11 SW is an active subwoofer that fits inside the rim of the spare tire. Its die-cast aluminum case makes it sturdy and long-lasting. Easy to install, the HR 11 SW provides a powerful and dynamic sound thanks to a dual voice coil speaker and a 200 Watt Class D digital amplifier. With the included remote control, the user can adjust the volume level, changes the phase, adjust the crossover frequency from 50 to 150Hz, and the bass boost up to 12dB.

HR 11 SW

11"/260 mm Spare Tire Active Subwoofer

Class D Amplifier, Low/High Level Inputs
Gain Control, LP Filter, Bass Boost, Phase Control
Auto Power-ON, Wired Remote Control
Aluminum Housing
-
Nominal / Transient Power: 200 W / 400 W
Frequency Response: 30 Hz ~ 160 Hz
Size: 36 (L) x 36 (W) x 12,6 (H) cm

TECHNICAL SPECIFICATIONS - 9000 SERIES

	9.1T-25 / 9.UMA Tw	9.1T-28	9.3M / 9.UMA Mid	9.4M	9.6W
GENERAL					
Speaker Type:	Dome Tweeter	Dome Tweeter	Cone Midrange	Cone Midrange	Mid-Woofer
Nominal Diameter:	1"/25 mm	1.1"/28 mm	3"/75 mm	4"/100 mm	6.5"/165 mm
Nominal Impedance (Znom):	4 Ohms	4 Ohms	4 Ohms	4 Ohms	4 Ohms
Continuous Power Handling:	100 W	110 W	100 W	120 W	180 W
Peak Power Handling:	200 W	220 W	200 W	240 W	360 W
Recommended Amplifier Power:	40 - 150 W (RMS)	50 - 170 W (RMS)	40 - 150 W (RMS)	50 - 200 W (RMS)	75 - 300 W (RMS)
Frequency Response:	1.6 KHz - 25 KHz	1.4 KHz - 25 KHz	130 Hz - 20 KHz	100 Hz - 20 KHz	48 Hz - 5 KHz
TECHNICAL PARAMETERS					
Dome/Cone Type:	Pure Japanese Silk	Pure Japanese Silk	High Modulus Carbon	High Modulus Carbon	High Modulus Carbon
Magnet Type:	N52H Neodymium	N52H Neodymium	Neodymium	Neodymium	Neodymium
Voice Coil Diameter (Vcd):	25 mm	28 mm	25.5 / 25 mm	25.5 mm	75 mm
Voice Coil Resistance (Re):	3.8 Ohms	3.8 Ohms	3.6 Ohms	4.1 Ohms	3.6 Ohms
Free Air Resonance (Fs):	1.25 KHz	900 Hz	125 Hz	135 Hz	61.9 Hz
Reference Efficiency (η°):	-	-	0.422 %	0.359 %	0.427 %
Sensitivity (1W/1m):	88.5 dB	91.5 dB	88.5 dB	87.6 dB	88.5 dB
Sensitivity (2.83V/1m):	91.5 dB	94.5 dB	91.5 dB	90.6 dB	91.5 dB
Electrical "Q" (Qes):	3.053	1.217	0.355	0.931	0.569
Mechanical "Q" (Qms):	1.874	1.903	11.364	3.645	2.202
Total Speaker "Q" (Qts):	1.116	0.742	0.344	0.741	0.452
Equivalent Compliance (Vas):	-	-	0.7 lt	1.4 lt	10.5 lt
Moving Mass (Mms):	-	-	2.8 g	4.5 g	16.5 g
Mechanical Compliance (Cms):	-	-	0.40 mm/N	0.306 mm/N	0.399 mm/N
Magnetic Strength (BL):	-	-	4.841 N/A	4.117 N/A	6.375 N/A
Effective Piston Area (Sd):	-	-	31.1 sq. cm	56.7 sq. cm	136.2 sq. cm
One-Way Linear Excursion (Xmax):	-	-	2.8 mm	2.8 mm	5.25 mm
DESIGN BANDWIDTH					
With 48 dB/oct. HP filters:	1.6 KHz - 25 KHz	1.5 KHz - 25 KHz	100 Hz - 20 KHz	100 Hz - 20 KHz	50 Hz - 5 KHz
With 24 dB/oct. HP filters:	1.9 KHz - 25 KHz	1.8 KHz - 25 KHz	120 Hz - 20 KHz	120 Hz - 20 KHz	70 Hz - 5 KHz
With 12 dB/oct. HP filters:	2.2 KHz - 25 KHz	2 KHz - 25 KHz	140 Hz - 20 KHz	140 Hz - 20 KHz	80 Hz - 5 KHz
OTHERS					
Driver Rear Displacement:	-	-	0.12 lt	0.14 lt	0.5 lt
Min. Rec. Sealed Enclosure:	-	-	0.6 lt	1 lt	11 lt

8000 SERIES

	8.028 / 8.003UMA Tw	8.075 / 8.003UMA Mid	8.165
GENERAL			
Speaker Type:	Dome Tweeter	Cone Midrange	Mid-Woofer
Nominal Diameter:	1.1"/28 mm	3"/75 mm	6.5"/165 mm
Nominal Impedance (Znom):	4 Ohms	4 Ohms	3 Ohms
Continuous Power Handling:	110 W	120 W	160 W
Peak Power Handling:	220 W	240 W	320 W
Recommended Amplifier Power:	40 - 150 W (RMS)	50 - 160 W (RMS)	60 - 280 W (RMS)
Frequency Response:	940 Hz - 25 KHz	95 Hz - 16 KHz	45 Hz - 4 KHz
TECHNICAL PARAMETERS			
Dome/Cone Type:	Torcon®	Unpressed Paper	Unpressed Paper
Magnet Type:	N52H Neodymium	N52H Neodymium	Y35 Ferrite
Voice Coil Diameter (Vcd):	28 mm	25.5 mm	32.4 mm
Voice Coil Resistance (Re):	3.4 Ohms	3.3 Ohms	2.2 Ohms
Free Air Resonance (Fs):	540 Hz	113 Hz	62.7 Hz
Reference Efficiency (η°):	-	0.25 %	0.57 %
Sensitivity (1W/1m):	91.0 dB	91.0 dB	89.0 dB
Sensitivity (2.83V/1m):	94.0 dB	94.0 dB	92.0 dB
Electrical "Q" (Qes):	0.928	0.42	0.43
Mechanical "Q" (Qms):	0.744	4.76	4.27
Total Speaker "Q" (Qts):	0.413	0.39	0.39
Equivalent Compliance (Vas):	-	0.95 lt	11.1 lt
Moving Mass (Mms):	-	2.45 g	13.5 g
Mechanical Compliance (Cms):	-	0.8 mm/N	0.475 mm/N
Magnetic Strength (BL):	-	3.83 N/A	5.20 N/A
Effective Piston Area (Sd):	-	29 sq. cm	130 sq. cm
One-Way Linear Excursion (Xmax):	-	5.7 mm	4.6 mm
DESIGN BANDWIDTH			
With 48 dB/oct. HP filters:	1.2 KHz - 25 KHz	114 Hz - 14 KHz	70 Hz - 4 KHz
With 24 dB/oct. HP filters:	1.6 KHz - 25 KHz	140 Hz - 14 KHz	80 Hz - 4 KHz
With 12 dB/oct. HP filters:	2 KHz - 25 KHz	160 Hz - 14 KHz	90 Hz - 4 KHz
OTHERS			
Driver Rear Displacement:	-	0.2 lt	0.6 lt
Min. Rec. Sealed Enclosure:	-	1 lt	8 lt

8.6K2 CX	
Crossover Type:	Passive 2-Way
Amp Connection:	Single / Bi-Amp.
Tweeter Levels (4):	0 / -2 / -4 / -6 dB
Woofer/Tweter Transition (2):	2.2 KHz / 2.6 KHz 12 dB/oct.
Peak Power Handling:	300 W

8.6K3 CX	
Crossover Type:	Passive 3-Way
Amp Connection:	Single / Bi-Amp.
Tweeter Levels (4):	0 / -2 / -4 / -6 dB
Tweeter Slope (2):	4.2 KHz 12/6 dB/oct.
Midrange Levels (4):	0 / -3 / -6 / -9 dB
Midrange Presence (3):	220 / 400 / 540 Hz 6 dB/oct.
Midrange Slope (2):	Full Range / 8 KHz 6 dB/oct.
Woofer/Mid Transition (4):	540 / 630 / 880 / 1100 Hz 12 dB/oct.
Peak Power Handling:	300 W

5000 SERIES

	5.028 / 5.UMA Tw	5.050 / 5.UMA Mid	5.165
GENERAL			
Speaker Type:	Dome Tweeter	Dome Midrange	Mid-Woofer
Nominal Diameter:	1.1"/28 mm	2"/50 mm	6.5"/165 mm
Nominal Impedance (Znom):	4 Ohms	4 Ohms	3 Ohms
Continuous Power Handling:	110 W	120 W	160 W
Peak Power Handling:	220 W	240 W	320 W
Recommended Amplifier Power:	40 - 150 W (RMS)	50 - 160 W (RMS)	60 - 280 W (RMS)
Frequency Response:	900 Hz - 25 KHz	500 Hz - 6 KHz	50 Hz - 3.5 KHz
TECHNICAL PARAMETERS			
Dome/Cone Type:	Carbon Fiber	Carbon Fiber	Carbon Fiber
Magnet Type:	Neodymium	Neodymium	Y35 Ferrite
Voice Coil Diameter (Vcd):	28 mm	25 mm	25 mm
Voice Coil Resistance (Re):	3.5 Ohms	3.5 Ohms	2.5 Ohms
Free Air Resonance (Fs):	710 Hz	630 Hz	71.3 Hz
Reference Efficiency (η°):	-	-	0.57 %
Sensitivity (1W/1m):	91.0 dB	91.0 dB	92.0 dB
Sensitivity (2.83V/1m):	94.0 dB	94.0 dB	95.0 dB
Electrical "Q" (Qes):	1.73	1.009	0.5
Mechanical "Q" (Qms):	1.95	2.60	4.0
Total Speaker "Q" (Qts):	0.91	0.75	0.45
Equivalent Compliance (Vas):	-	-	9.47 lt
Moving Mass (Mms):	-	-	12.1 g
Mechanical Compliance (Cms):	-	-	0.4 mm/N
Magnetic Strength (BL):	-	-	5.16 N/A
Effective Piston Area (Sd):	-	-	143 sq. cm
One-Way Linear Excursion (Xmax):	-	-	4.5 mm
DESIGN BANDWIDTH			
With 48 dB/oct. HP filters:	1.2 KHz - 25 KHz	600 Hz - 5 KHz	50 Hz - 4 KHz
With 24 dB/oct. HP filters:	1.6 KHz - 25 KHz	700 Hz - 5 KHz	70 Hz - 4 KHz
With 12 dB/oct. HP filters:	2 KHz - 25 KHz	800 Hz - 5 KHz	80 Hz - 4 KHz
OTHERS			
Driver Rear Displacement:	-	-	0.6 lt
Min. Rec. Sealed Enclosure:	-	-	6 lt

	5.6K2 CX
Crossover Type:	Passive 2-Way
Amp Connection:	Single Amp.
Tweeter Levels (2):	0 / -2 dB
Crossover Frequency:	2.1 KHz 12 dB/oct.
Peak Power Handling:	300 W

	5.6K3 CX
Crossover Type:	Passive 3-Way
Amp Connection:	Single Amp.
Tweeter Levels (2):	0 / -3 dB
Midrange Levels (2):	0 / -2 dB
Crossover Frequency:	900 / 3600 Hz 12 dB/oct.
Peak Power Handling:	300 W

4000 SERIES

	4.28 / 4.UMA Tw	4.75 / 4.UMA Mid	4.165	4.6C	
GENERAL				Tweeter	Woofer
Speaker Type:	Dome Tweeter	Cone Midrange	Mid-Woofer	Coaxial	
Nominal Diameter:	1.1"/28 mm	3"/75 mm	6.5"/165 mm	1"/25 mm	6.5"/165 mm
Nominal Impedance (Znom):	4 Ohms	4 Ohms	4 Ohms	4 Ohms	
Continuous Power Handling:	100 W	100 W	150 W	100 W	
Peak Power Handling:	200 W	200 W	300 W	200 W	
Recommended Amplifier Power:	40 - 150 W (RMS)	40 - 150 W (RMS)	60 - 225 W (RMS)	40 - 180 W (RMS)	
Frequency Response:	1.5 KHz - 22 KHz	140 Hz - 12 KHz	55 Hz - 6 KHz	55 Hz - 22 KHz	
TECHNICAL PARAMETERS					
Dome/Cone Type:	Sonatex Silk	Long Fiber Paper	Long Fiber Paper	High Module Silk	Long Fiber paper
Magnet Type:	Neodymium	Neodymium	Y35 Ferrite	N42H Neodymium	Y35 Ferrite
Voice Coil Diameter (Vcd):	28 mm	25.5 mm	25.5 mm	25.4 mm	25.5 mm
Voice Coil Resistance (Re):	3.6 Ohms	3.78 Ohms	2.91 Ohms	3.71Ohms	2.91 Ohms
Free Air Resonance (Fs):	990 Hz	78.5 Hz	57.3 Hz	1300 Hz	57.3 Hz
Reference Efficiency (η°):	-	0.346 %	0.364 %	-	0.364 %
Sensitivity (1W/1m):	90.5 dB	87.6 dB	89.5 dB	89.0 dB	89.5 dB
Sensitivity (2.83V/1m):	93.5 dB	90.6 dB	92.5 dB	92.0 dB	92.5 dB
Electrical "Q" (Qes):	1.107	0.299	0.625	1.686	0.625
Mechanical "Q" (Qms):	0.939	2.397	4.403	1.129	4.403
Total Speaker "Q" (Qts):	0.508	0.266	0.547	0.676	0.547
Equivalent Compliance (Vas):	-	2.22 lt	12.55 lt	-	12.55 lt
Moving Mass (Mms):	-	3.87 g	15.3 g	-	15.3 g
Mechanical Compliance (Cms):	-	0.106 mm/N	0.504 mm/N	-	0.504 mm/N
Magnetic Strength (BL):	-	4.917 N/A	5.065 N/A	-	5.065 N/A
Effective Piston Area (Sd):	-	38 sq. cm	133.73 sq. cm	-	132.73 sq. cm
One-Way Linear Excursion (Xmax):	-	2.6 mm	4.5 mm	-	4.5 mm
DESIGN BANDWIDTH					
With 48 dB/oct. HP filters:	2 KHz - 22 KHz	140 Hz - 10 KHz	60 Hz - 6 KHz	60 Hz - 22 KHz	
With 24 dB/oct. HP filters:	2.2 KHz - 22 KHz	180 Hz - 10 KHz	70 Hz - 6 KHz	70 Hz - 22 KHz	
With 12 dB/oct. HP filters:	2.4 KHz - 22 KHz	220 Hz - 10 KHz	80 Hz - 6 KHz	80 Hz - 22 KHz	
OTHERS					
Driver Rear Displacement:	-	0.07 lt	0.35 lt	-	0.35 lt
Min. Rec. Sealed Enclosure:	-	0.4 lt	9 lt	-	9 lt

3000 SERIES

	3.25 / 3.UMA Tw	3.28	3.UMA Mid	3.65	3.90
GENERAL					
Speaker Type:	Dome Tweeter	Dome Tweeter	Cone Midrange	Widerange	Cone Midrange
Nominal Diameter:	1"/25 mm	1.1"/28 mm	2.5"/65 mm	2.5"/65 mm	3.5"/90 mm
Nominal Impedance (Znom):	4 Ohms	4 Ohms	4 Ohms	4 Ohms	4 Ohms
Continuous Power Handling:	80 W	90 W	100 W	60 W	60 W
Peak Power Handling:	160 W	180 W	200 W	120 W	120 W
Recommended Amplifier Power:	20 - 110 W (RMS)	30 - 120 W (RMS)	40 - 160 W (RMS)	20 - 100 W (RMS)	20 - 100 W (RMS)
Frequency Response:	900 Hz - 25 KHz	900 Hz - 25 KHz	130 Hz - 16 KHz	130 Hz - 22 KHz	170 Hz - 7 KHz
TECHNICAL PARAMETERS					
Dome/Cone Type:	High Module Silk	High Module Silk	Treated Paper	Treated Paper	Treated Paper
Magnet Type:	N42H Neodymium	N42H Neodymium	N42H Neodymium	N42H Neodymium	Y35 Ferrite
Voice Coil Diameter (Vcd):	25.4 mm	28 mm	20 mm	20 mm	20 mm
Voice Coil Resistance (Re):	3.71 Ohms	3.5 Ohms	3.83 Ohms	3.7 Ohms	4.74 Ohms
Free Air Resonance (Fs):	1.3 KHz	505 Hz	112.2 Hz	143.5 Hz	123 Hz
Reference Efficiency (η°):	-	-	0.089 %	0.109 %	0.417 %
Sensitivity (1W/1m):	89.0 dB	91.0 dB	89.0 dB	83.0 dB	88.5 dB
Sensitivity (2.83V/1m):	92.0 dB	94.0 dB	92.0 dB	86.0 dB	91.5 dB
Electrical "Q" (Qes):	1.686	0.568	1.067	1.286	0.711
Mechanical "Q" (Qms):	1.129	1.529	4.228	3.428	1.980
Total Speaker "Q" (Qts):	0.676	0.554	0.852	0.935	0.523
Equivalent Compliance (Vas):	-	-	0.69 lt	0.492 lt	1.659 lt
Moving Mass (Mms):	-	-	1.917 g	1.65 g	2.075 g
Mechanical Compliance (Cms):	-	-	1.050 mm/N	0.742 mm/N	0.707 mm/N
Magnetic Strength (BL):	-	-	2.204 N/A	2.08 N/A	3.49 N/A
Effective Piston Area (Sd):	-	-	21.65 sq. cm	21.65 sq. cm	40.72 sq. cm
One-Way Linear Excursion (Xmax):	-	-	3 mm	3 mm	1.37 mm
DESIGN BANDWIDTH					
With 48 dB/oct. HP filters:	2 KHz - 25 KHz	1.8 KHz - 25 KHz	200 Hz - 12 KHz	200 Hz - 22 KHz	200 Hz - 5 KHz
With 24 dB/oct. HP filters:	2.2 KHz - 25 KHz	2 KHz - 25 KHz	240 Hz - 12 KHz	240 Hz - 22 KHz	230 Hz - 5 KHz
With 12 dB/oct. HP filters:	2.2 KHz - 25 KHz	2.2 KHz - 25 KHz	280 Hz - 12 KHz	280 Hz - 22 KHz	260 Hz - 5 KHz
OTHERS					
Driver Rear Displacement:	-	-	0.2 lt	0.3 lt	0.1 lt
Min. Rec. Sealed Enclosure:	-	-	0.4 lt	0.4 lt	1 lt

3.165	3.69	3.6C		3.69C	
		Tweeter	Woofer	Tweeter	Woofer
Mid-Woofer	Woofer	Coaxial		Convertible Speaker	
6.5"/165 mm	6x9"/150x230 mm	1"/25 mm	6.5"/165 mm	1"/25 mm	6x9"/150x230 mm
4 Ohms	4 Ohms	4 Ohms		4 Ohms	
120 W	120 W	80 W		120 W	
240 W	240 W	160 W		240 W	
40 - 200 W (RMS)	40 - 200 W (RMS)	20 - 140 W (RMS)		40 - 200 W (RMS)	
65 Hz - 9 KHz	55 Hz - 9 KHz	65 Hz - 25 KHz		65 Hz - 25 KHz	
Treated Paper	Treated Paper	High Module Silk	Treated Paper	High Modulus Silk	Treated Paper
Y35 Ferrite	Y35 Ferrite	N35 Neodymium	Y35 Ferrite	N42 Neodymium	Y35 Ferrite
25 mm	25 mm	20.4 mm	25 mm	20.4 mm	25 mm
3.11 Ohms	3.14 Ohms	3.62 Ohms	3.11 Ohms	3.71 Ohms	3.14 Ohms
64.98 Hz	58.9 Hz	1.9 KHz	64.98 Hz	1.3 KHz	58.9 Hz
0.446 %	0.446 %	-	0.446 %	-	0.446 %
88.5 dB	88.5 dB	88.5 dB	88.5 dB	88.5 dB	88.5 dB
91.5 dB	91.5 dB	91.5 dB	91.5 dB	91.5 dB	91.5 dB
0.766	1.302	3.805	0.766	1.686	1.302
3.026	3.744	2.219	3.026	1.129	3.744
0.611	0.966	1.402	0.611	0.676	0.966
13.93 lt	27.79 lt	-	13.93 lt	-	27.79 lt
11.63 g	16.89 g	-	11.63 g	-	16.89 g
0.516 mm/N	0.432 mm/N	-	0.516 mm/N	-	0.432 mm/N
4.39 N/A	4.19 N/A	-	4.39 N/A	-	4.19 N/A
132.7 sq. cm	213.13 sq. cm	-	132.7 sq. cm	-	213.13 sq. cm
3.25 mm	3.25 mm	-	3.25 mm	-	3.25 mm
70 Hz - 5 KHz	60 Hz - 5 KHz	2 KHz - 25 KHz	70 Hz - 5 KHz	2 KHz - 25 KHz	60 Hz - 5 KHz
80 Hz - 5 KHz	70 Hz - 5 KHz	2.2 KHz - 25 KHz	80 Hz - 5 KHz	2.2 KHz - 25 KHz	70 Hz - 5 KHz
90 Hz - 5 KHz	80 Hz - 5 KHz	2.4 KHz - 25 KHz	90 Hz - 5 KHz	2.4 KHz - 25 KHz	80 Hz - 5 KHz
0.6 lt	0.7 lt	-	0.6 lt	-	0.7 lt
10 lt	10 lt	-	9 lt	-	12 lt

2000 SERIES

	2.6K2XP		2.6K2X		2.6C	
GENERAL	Tweeter	Woofer	Tweeter	Woofer	Tweeter	Woofer
Speaker Type:	2-Way Speaker System		2-Way Speaker System		Coaxial	
Nominal Diameter:	1.1"/28 mm	6.5"/165 mm	1"/25 mm	6.5"/165 mm	1"/25 mm	6x9"/150x230 mm
Nominal Impedance (Znom):	4 Ohms	4 Ohms	4 Ohms	4 Ohms	4 Ohms1"/25 mm	
Continuous Power Handling:	90 W	120 W	80 W	120 W	80 W	
Peak Power Handling:	180 W	240 W	160 W	240 W	160 W	
Recommended Amplifier Power:	30 - 120 W (RMS)	40 - 200 W (RMS)	20 - 110 W (RMS)	40 - 200 W (RMS)	20 - 140 W (RMS)	
Frequency Response:	65 Hz - 25 KHz		65 Hz - 25 KHz		65 Hz - 25 KHz	
TECHNICAL PARAMETERS						
Dome/Cone Type:	High Module Silk	Treated Paper	High Module Silk	Treated Paper	High Module Silk	Treated Paper
Magnet Type:	N42H Neodymium	Y35 Ferrite	N42H Neodymium	Y35 Ferrite	N35 Neodymium	Y35 Ferrite
Voice Coil Diameter (Vcd):	28 mm	25 mm	25.4 mm	25 mm	20.4 mm	25 mm
Voice Coil Resistance (Re):	3.5 Ohms	3.11 Ohms	3.71 Ohms	3.11 Ohms	3.62 Ohms	3.11 Ohms
Free Air Resonance (Fs):	505 Hz	64.98 Hz	1.3 KHz	64.98 Hz	1.9 KHz	64.98 Hz
Reference Efficiency (η°):	-	0.446 %	-	0.446 %	-	0.446 %
Sensitivity (1W/1m):	91.0 dB	88.5 dB	89.0 dB	88.5 dB	88.5 dB	88.5 dB
Sensitivity (2.83V/1m):	94.0 dB	91.5 dB	92.0 dB	91.5 dB	91.5 dB	91.5 dB
Electrical "Q" (Qes):	0.568	0.766	1.686	0.766	3.805	0.766
Mechanical "Q" (Qms):	1.529	3.026	1.129	3.026	2.219	3.026
Total Speaker "Q" (Qts):	0.554	0.611	0.676	0.611	1.402	0.611
Equivalent Compliance (Vas):	-	13.93 lt	-	13.93 lt	-	13.93 lt
Moving Mass (Mms):	-	11.63 g	-	11.63 g	-	11.63 g
Mechanical Compliance (Cms):	-	0.516 mm/N	-	0.516 mm/N	-	0.516 mm/N
Magnetic Strength (BL):	-	4.39 N/A	-	4.39 N/A	-	4.39 N/A
Effective Piston Area (Sd):	-	132.7 sq. cm	-	132.7 sq. cm	-	132.7 sq. cm
One-Way Linear Excursion (Xmax):	-	3.25 mm	-	3.25 mm	-	3.25 mm
DESIGN BANDWIDTH						
With 48 dB/oct. HP filters:	1.8 KHz - 25 KHz	70 Hz - 5 KHz	2 KHz - 25 KHz	70 Hz - 5 KHz	2 KHz - 25 KHz	70 Hz - 5 KHz
With 24 dB/oct. HP filters:	2 KHz - 25 KHz	80 Hz - 5 KHz	2.2 KHz - 25 KHz	80 Hz - 5 KHz	2.2 KHz - 25 KHz	80 Hz - 5 KHz
With 12 dB/oct. HP filters:	2.2 KHz - 25 KHz	90 Hz - 5 KHz	2.2 KHz - 25 KHz	90 Hz - 5 KHz	2.4 KHz - 25 KHz	90 Hz - 5 KHz
OTHERS						
Driver Rear Displacement:	-	0.6 lt	-	0.6 lt	-	0.6 lt
Min. Rec. Sealed Enclosure:	-	10 lt	-	10 lt	-	9 lt

1000 SERIES

	1.6K2X		1.6C		1.10SD4	1.10SD2
GENERAL	Tweeter	Woofer	Tweeter	Woofer		
Speaker Type:	2-Way Speaker System		Coaxial		Subwoofer	Cone Midrange
Nominal Diameter:	1"/25 mm	6.5"/165 mm	0.8"/20 mm	6.5"/165 mm	10"/250 mm	3"/75 mm
Nominal Impedance (Znom):	4 Ohms		4 Ohms		4 + 4 Ohms	2 + 2 Ohms
Continuous Power Handling:	90 W		90 W		250 W	250 W
Peak Power Handling:	180 W		180 W		500 W	500 W
Recommended Amplifier Power:	30 - 120 W (RMS)		30 - 120 W (RMS)		200 - 300 W (RMS)	200 - 300 W (RMS)
Frequency Response:	50 Hz - 21 KHz		50 Hz - 20 KHz		30 Hz - 400 Hz	30 Hz - 400 Hz
TECHNICAL PARAMETERS						
Dome/Cone Type:	Silk	Pressed Paper	Silk	Treated Paper	Polystyrene	Polystyrene
Magnet Type:	N35 Neodymium	Y25 Ferrite	N38 Neodymium	Y25 Ferrite	40.5 Oz Ferrite	40.5 Oz Ferrite
Voice Coil Diameter (Vcd):	25.4 mm	25.5 mm	20.4 mm	25.5 mm	51 mm	51 mm
Voice Coil Resistance (Re):	2.8 Ohms	3.3 Ohms	2.4 Ohms	3.3 Ohms	1.8 Ohm	1 Ohm
Free Air Resonance (Fs):	1.4 KHz	64 Hz	1.65 KHz	68.5 Hz	34.2 Hz	34.6 Hz
Reference Efficiency (η°):	-	0.26 %	-	0.28 %	-	-
Sensitivity (1W/1m):	89.0 dB	88.0 dB	88.0 dB	88.0 dB	90.0 dB	93.0 dB
Sensitivity (2.83V/1m):	92.0 dB	91.0 dB	91.0 dB	91.0 dB	93.0 dB	96.0 dB
Electrical "Q" (Qes):	-	1.10	-	1.11	0.89	0.72
Mechanical "Q" (Qms):	-	4.21	-	5.29	5.42	4.58
Total Speaker "Q" (Qts):	-	0.87	-	0.99	0.76	0.62
Equivalent Compliance (Vas):	-	11.5 lt	-	11.2 lt	27.6 lt	26.8 lt
Moving Mass (Mms):	-	14.1 g	-	12.2 g	124.1 g	127.5 g
Mechanical Compliance (Cms):	-	0.44 mm/N	-	0.44 mm/N	0.17 mm/N	0.17 mm/N
Magnetic Strength (BL):	-	4.1 N/A	-	3.8 N/A	-	-
Effective Piston Area (Sd):	-	135.6 sq. cm	-	135.6 sq. cm	338.1 sq. cm	338.1 sq. cm
One-Way Linear Excursion (Xmax):	-	3.45 mm	-	3.45 mm	-	-
DESIGN BANDWIDTH						
With 48 dB/oct. HP filters:	70 Hz - 20 KHz		70 Hz - 20 KHz		-	-
With 24 dB/oct. HP filters:	75 Hz - 20 KHz		75 Hz - 20 KHz		-	-
With 12 dB/oct. HP filters:	78 Hz - 20 KHz		78 Hz - 20 KHz		-	-
OTHERS						
Driver Rear Displacement:	-	0.5 lt	-	0.5 lt	-	-
Min. Rec. Sealed Enclosure:	-	10 lt	-	10 lt	22 lt	22 lt

HARMONY SERIES

	HB1.6K2X		HB1.6C	
GENERAL	Tweeter	Woofer	Tweeter	Woofer
Speaker Type:	2-Way Speaker System		Coaxial	
Nominal Diameter:	1"/25 mm	6.5"/165 mm	0.55"/14 mm	6x9"/150x230 mm
Nominal Impedance (Znom):	4 Ohms		4 Ohms	
Continuous Power Handling:	65 W		50 W	
Peak Power Handling:	130 W		100 W	
Recommended Amplifier Power:	20 - 100 W (RMS)		15 - 80 W (RMS)	
Frequency Response:	65 Hz - 20 KHz		65 Hz - 18 KHz	
TECHNICAL PARAMETERS				
Dome/Cone Type:	Silk	Pressed Paper	Silk	Treated Paper
Magnet Type:	N35 Neodymium	Y25 Ferrite	N35 Neodymium	Y25 Ferrite
Voice Coil Diameter (Vcd):	20.4 mm	25.5 mm	13.3 mm	25.5 mm
Voice Coil Resistance (Re):	3.3 Ohms	3.3 Ohms	3.6 Ohms	3.3 Ohms
Free Air Resonance (Fs):	-	65.2 Hz	-	71.2 Hz
Reference Efficiency (η°):	-	-	-	-
Sensitivity (1W/1m):	89.0 dB	89.0 dB	88.0 dB	88.0 dB
Sensitivity (2.83V/1m):	92.0 dB	92.0 dB	91.0 dB	91.0 dB
Electrical "Q" (Qes):	-	1.87	-	1.97
Mechanical "Q" (Qms):	-	5.32	-	4.95
Total Speaker "Q" (Qts):	-	1.38	-	1.41
Equivalent Compliance (Vas):	-	10.5 lt	-	10.1 lt
Moving Mass (Mms):	-	15.3 g	-	12.9 g
Mechanical Compliance (Cms):	-	0.39 mm/N	-	0.39 mm/N
Magnetic Strength (BL):	-	3.3 N/A	-	3.1 N/A

	HR 10 US	HR 10 US-A	HR 11 SW
GENERAL			
Speaker Type:	Active Subwoofer	Android Active Subwoofer	Active Subwoofer
Installation:	Underseat / Trunk	Underseat / Trunk	Spare Tyre
Nominal Diameter:	10"/250 mm	10"/250 mm	11"/260 mm
Enclosure Housing:	Aluminum	Aluminum	Aluminum
Continuous Power Handling:	130 W	4 x 35 + 1 x 200 W	200 W
Peak Power Handling:	260 W	4 x 70 + 1 x 200 W	400 W
Amplifier Type:	Class AB	Class AB	Class D
Frequency Response:	10 Hz - 150 Hz	20 Hz - 22 KHz	30 Hz - 160 Hz
TECHNICAL PARAMETERS			
S/N Ratio:	91 dB	91 dB	92 dB
THD+Noise:	0.05 %	0.05 %	0.03 %
Low-Level Input:	2 x RCA	-	2 Channels
High-Level Input:	Yes	Yes	Yes
Auto Power-On:	Yes	Yes	-
Low-Pass Filter:	50 Hz - 150 Hz	50 Hz - 150 Hz	50 Hz - 150 Hz
Gain Control:	150 mV - 6 V	150 mV - 6 V	200 mV - 6 V
Bass Boost:	0 - 12 dB	0 - 12 dB	0 - 12 dB
Phase Control:	0 - 180°	0 - 180°	0 - 180°
Remote Control:	Subwoofer Level	Gain / Bass Boost / LPF / Phase	Gain / Bass Boost / LPF / Phase
Operating Voltage:	14.4V (10V - 16V)	14.4V (10V - 16V)	14.4V (10V - 16V)
OTHERS			
Dimensions (mm):	346 x 261 x 78	345 x 245 x 78	360 x 360 x 126.5
Fuse Rating:	15 A	25 A	25 A

The installation of our speakers must be done by professional technicians. Always contact an ESB Authorized Dealer. If properly installed, they will give you years of great audio experience. Some features or specifications could be modified during production to improve the product performance. The technical specifications and functionalities stated here are current as of the time of publication.

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