YAMAHA NS-2000

Natural Sound Speaker System

33-cm (13") Pure Carbon Fiber Woofer Cone

Improved Beryllium Midrange and Tweeter Domes

Unique In-Line Speaker Configuration and Rounded Baffle

Superbly Crafted Cabinetry

Uncompromising Choice of Materials and Construction Throughout



THE SPEAKER THAT ONLY YAMAHA COULD HAVE DEVELOPED

The Yamaha NS-2000 represents a remarkable achievement in speaker performance. Never before has a speaker system produced sound so rich, so pure, so completely natural, to match the capabilities of today's finest audio systems and new developments such as digital audio sources. And never before has a speaker incorporated such a stunning array of sophisticated technology, state-of-the-art materials, and concert-quality acoustical performance—the blend of expertise in materials and musical reproduction that only Yamaha can bring to speaker development.

Every speaker component incorporated in the NS-2000 was developed for uncompromising individual performance as well as for the highest overall performance as part of an integrated speaker system. The beryllium midrange and tweeter domes originally introduced in the highly-acclaimed NS-1000(M) speaker systems were further refined to deliver even finer response and clearer rendition of the critical middle and high frequencies. An all-new carbon fiber woofer cone was developed that improves low frequency performance while providing ideal tonal balance with the midrange and tweeter units. A new crossover network virtually eliminates distortion. Another unique feature is a center in-line speaker arrangement that achieves optimum sound dispersion and stereo imaging. To use this configuration without suffering the image-smearing effects of cabinet edge diffraction the baffle has been specially designed with rounded edges, the precise shape of which was determined with the aid of sophisticated computer analysis.

But, at Yamaha, the ultimate consideration is always: "How does it sound?" To find out, we auditioned the NS-2000 for some of the world's toughest music critics—our own acoustics experts who help produce the many musical intruments for which Yamaha is famous throughout the world. If the pianos, horns, or voices were not rendered perfectly, our engineers would know it. To put it mildly, the experts were excited with what they heard. And you will be, too. Because at Yamaha, great sound is the result of a happy fusion of audio technology and an intimate knowledge of music.

In the NS-2000, we've really outdone ourselves. This is a speaker for the truly discerning audiophile. This is a speaker for the music lover who will not listen to anything but the best. This is the speaker by which all other speakers will hereafter be judged.

This is the Yamaha NS-2000.



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Behind the Superior Yamaha Sound

Yamaha's foundation as a manufacturer spans more than a hundred years in a number of specialized fields. Since the company began as a producer of reed organs, it has expanded steadily until today, Yamaha music instruments, sound reinforcement gear, music education and popularization programs, motor products, sports equipment, and of course, audio products, are renowned worldwide for their highly refined performance.

Naturally, the many years spent in intensive research and development in all these fields has resulted in a vast and varied store of technology. Moreover, the finely balanced interrelationship between the many Yamaha in-house technologies, production facilities and product groups creates a highly efficient network that makes it possible to achieve optimum quality and performance in every product. Yamaha audio know-how, however, does not stop at technology. Each and every new audio product must face the most demanding challenge imaginable: the critical ears of Yamaha music instrument designers. Unless the reproduced sound is exactly like the real thing, the product is not considered finished. Yamaha gives you vast technology tamed by musical sensitivity – a claim no other audio manufacturer can honestly make.

SIMPLY, THE WORLD'S FINEST SPEAKER

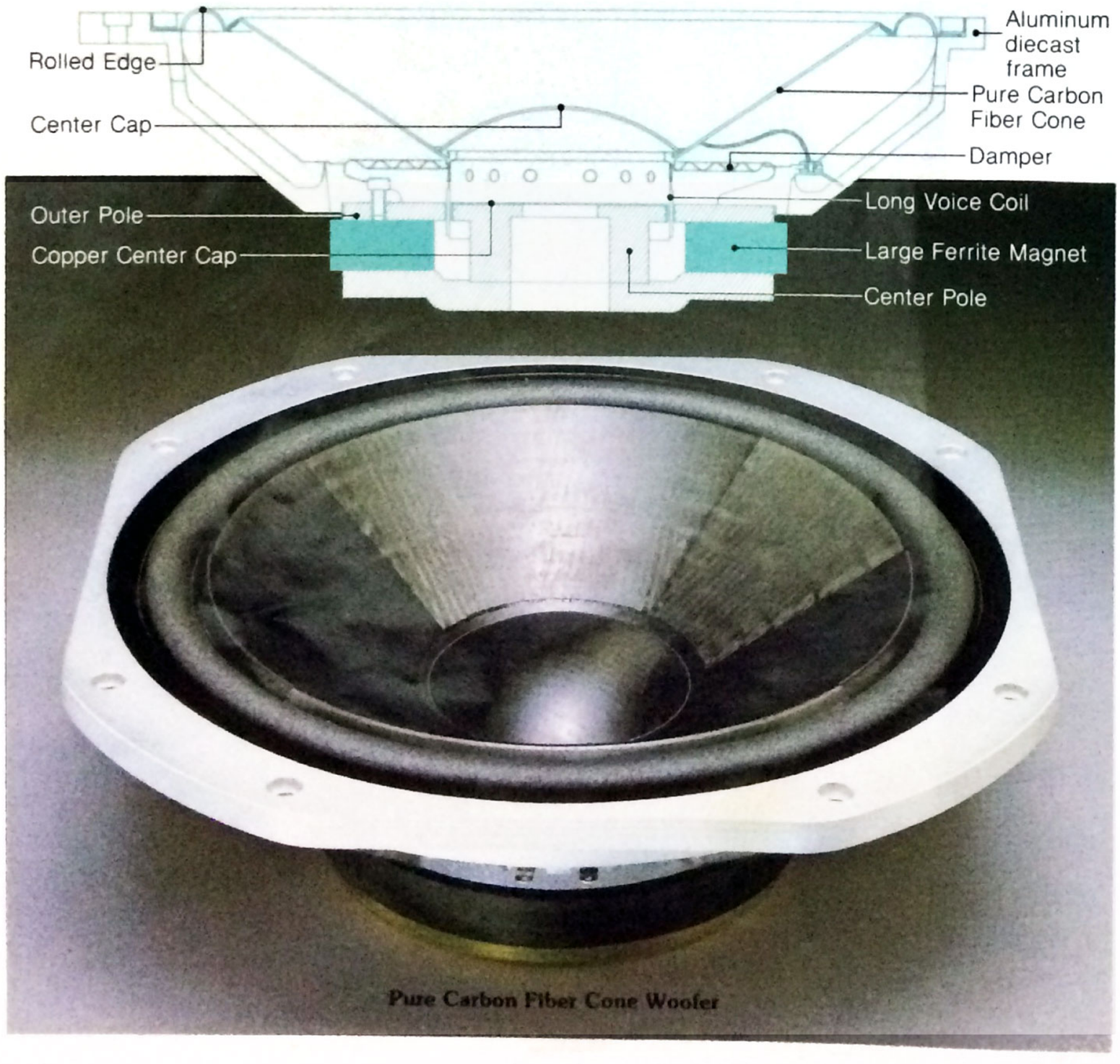
Pure Carbon Fiber Woofer Cone

Carbon fiber exhibits excellent strength/weight characteristics, which has made it a popular material for products such as sports equipment, where high rigidity, low weight, and superior damping are required. Interestingly, carbon fiber also displays outstanding sound propagation capabilities—approaching that of beryllium, the metal with superior acoustic properties that only Yamaha has successfully applied to speaker domes, and which has been ultimately refined in the NS-2000.

Not surprisingly, attempts had been made to incorporate carbon fiber into woofer cones, but as a 20% blend of short carbon fibers with conventional woofer cone materials—the results were less than satisfactory. Yamaha, as usual, took a different approach. Instead of compromising the superior audio reproduction qualities of pure carbon by combining it with conventional materials, we developed a method of fabricating long carbon fibers into sheets.

As expected, these sheets exhibited the optimum balance of response and damping that would make them an excellent speaker material.

To bring the advantages of pure carbon fiber to the NS-2000, Yamaha combines eight flat sheets into a 33 cm (13") diameter woofer cone by a special matrix construction method. This straight conical shape provides optimum response and maximum overall rigidity, resulting in superb low frequency definition and accurate rendition of the most powerful bass notes. And since the sonic properties of the carbon fiber cone so closely approach those of beryllium, absolutely stunning overall reproduction balance has been achieved.



Pure Carbon Fiber Cone Woofer

Beryllium-Dome Midrange Driver

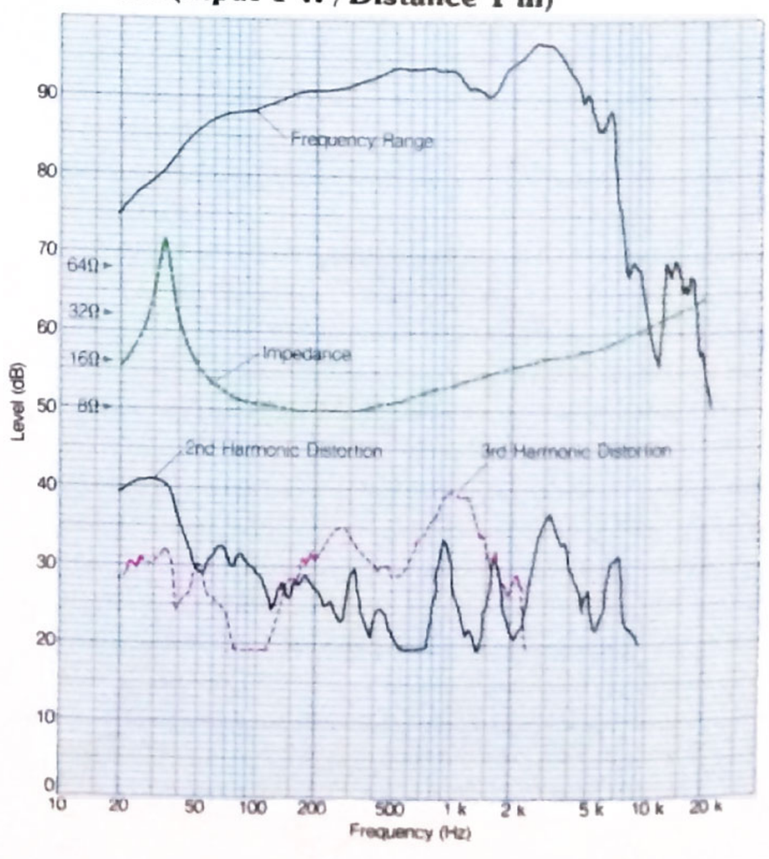
Beryllium is a remarkable speaker dome material. In fact, it is undoubtedly the finest available, but only Yamaha has been able to take advantage of its superior sonic properties in speaker design. Compared to other common dome materials such as aluminum and titanium, density (and thus unit weight) is significantly lower—just 2/3 that of aluminum and 2/5 that of titanium—yet rigidity is substantially higher: 4 times and 2.5 times, respectively.

Beryllium's strength makes it extremely difficult to accurately fabricate as a speaker dome using conventional methods, and even microscopic variations in thickness or dome shape can adversely affect its superb audio reproduction capabilities. But Yamaha technology found a way to precision form these domes by adapting its highly sophisticated LSI manufacturing techniques that involve high-

Characteristics of Speaker Cone & Dome Materials

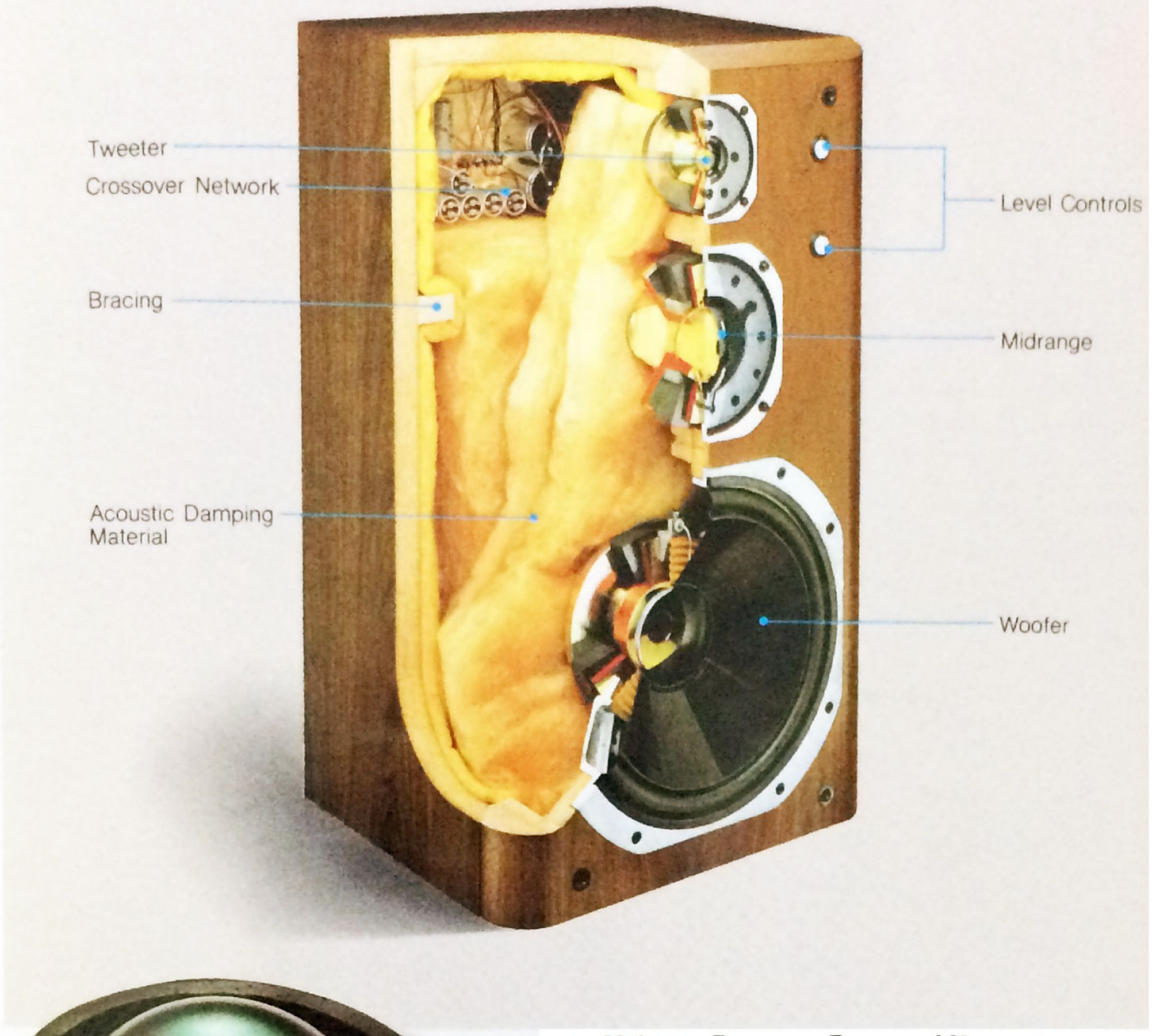
	Pure Carbon Fiber	Beryllium (Be)	Titanium (Ti)	Aluminum (Al)
Density ρ (kg/m³)	1.55×10^{3}	1.84×10^{3}	4.54×10^{3}	2.69×10^{3}
Rigidity (elasticity modulus) E (N/m²)	13×10^{10}	28×10^{10}	11×10^{10}	7.1×10^{10}
Sound Propagation Velocity $C=\sqrt{E/\rho}$ (m/sec)	9.2×10^{3}	12.3×10^{3}	4.9×10^{3}	5.2×10^{3}
Tensile Strength (kg/mm²)	160	32–50	35–70	5–9

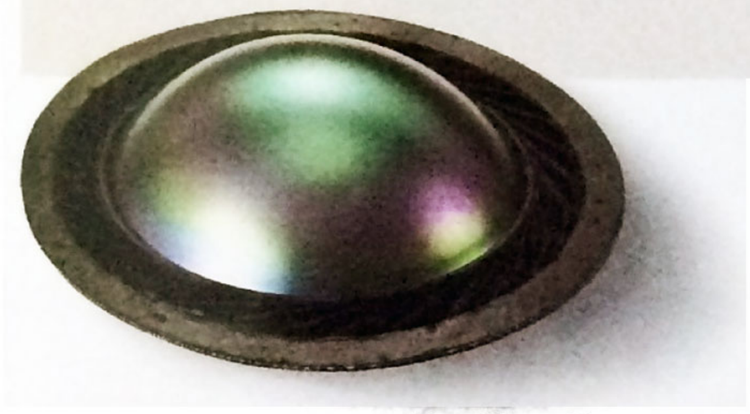
Woofer Frequency Range, Impedance and Harmonic Distortion (Input 1 W/Distance 1 m)



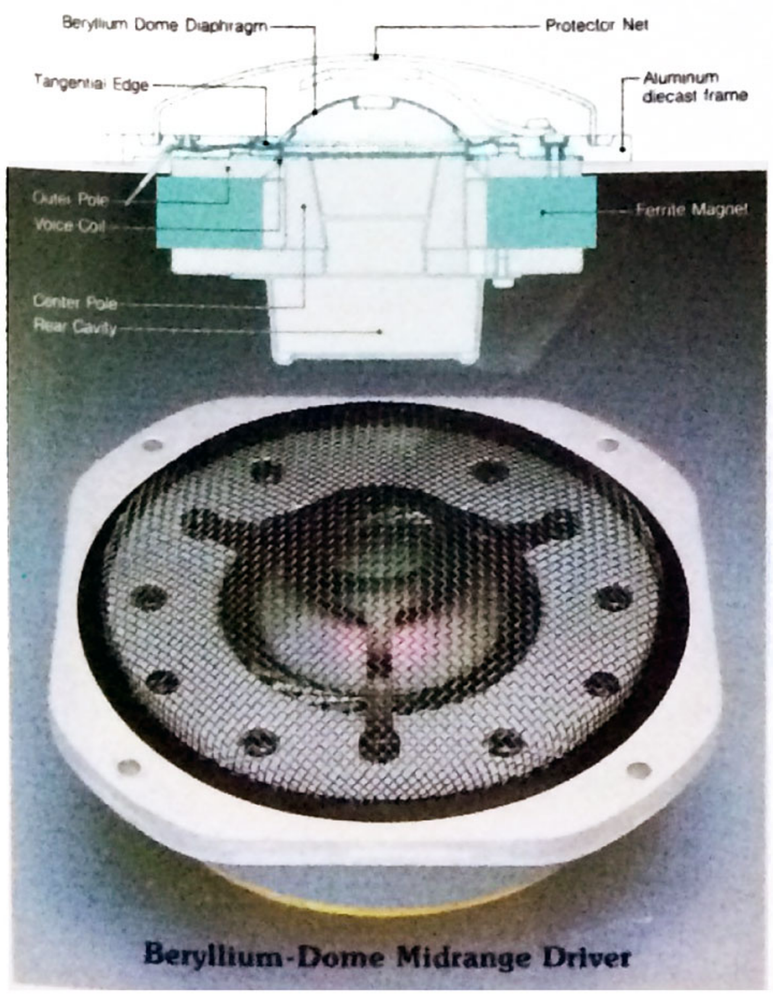
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NS-2000 Cutaway View



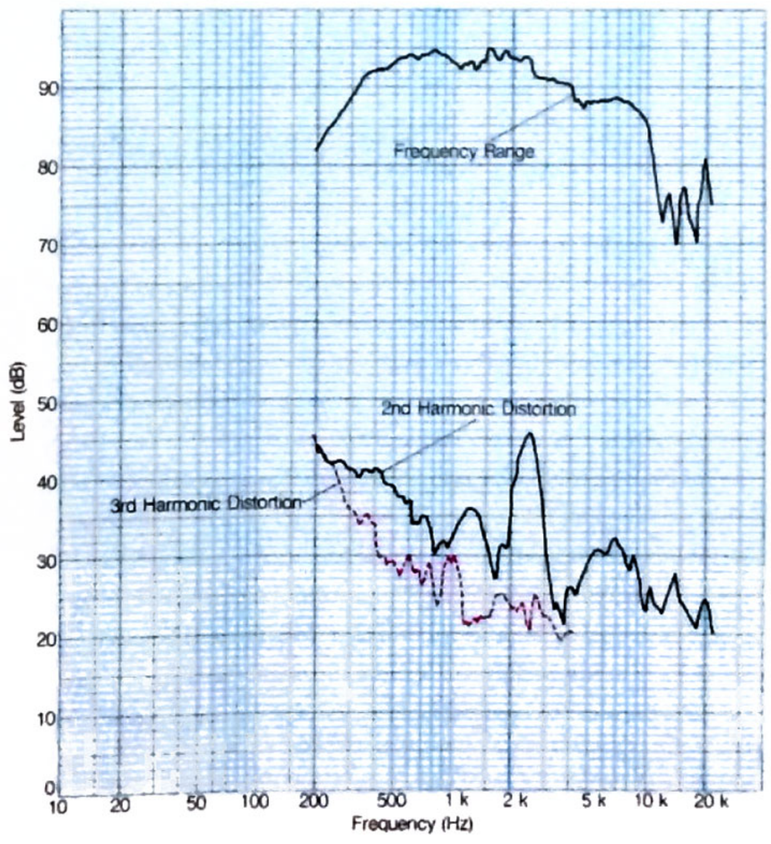


Beryllium Dome Diaphragm

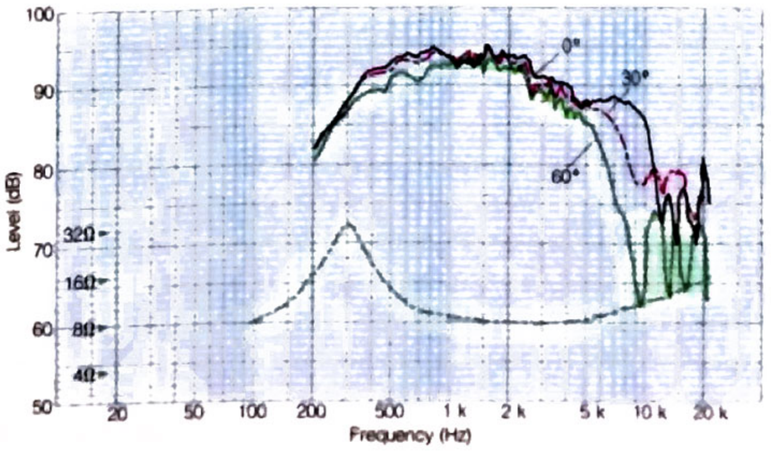


Beryllium-Dome Midrange Driver

Midrange Frequency Range and Harmonic Distortion (Input 1 W/Distance 1 m)



Midrange Directivity and Impedance



purity deposition of extremely uniform layers of metals for semiconductor junctions. In this technique, the metal is vaporized in a vacuum and is deposited on a precision mold by an electron beam, producing perfectly shaped domes of consistent thickness.
This technology has been even further refined for production of midrange and tweeter domes for the NS-2000. The beryllium particles were made finer for more uniform distribution across the entire dome surface, producing an even thinner, lighter dome than found even on the superb NS-1000(M). So although the midrange dome diameter is the same at 8.8 cm (3-1/2"), weight is reduced to 0.5 grams. This provides new levels of midrange performance—both in the excellent definition of each voice and instrument, and in superbly smooth transition with the pure carbon woofer and the beryllium tweeter for optimum tonal balance.

Beryllium-Dome Tweeter

Beryllium's superiority as a tweeter dome material is mainly justified by its exceptionally accurate, consistent response over the entire dome surface to frequencies up to and beyond 20,000 Hz (which is beyond the output range of most audio components). Heavier, less responsive domes cannot accurately reproduce these high frequencies, while domes lacking sufficient hardness are plagued by breakup distortion caused by inconsistent response at different points across the dome's surface.
As with the midrange dome, advances in Yamaha fabrication technology have allowed us to make the 3 cm (1-3/16") tweeter dome lighter and more responsive than ever—a remarkably lightweight 0.028 grams, with superb accuracy from 2,000 to over 20,000 Hz.
Like the midrange unit, the tweeter features Yamaha's unique deep dome construction with a specially designed diffuser for greater sound dispersion and enhanced stereo imaging.

Attention to Detail that Produces Superior Sound

Tangential edges (midrange and tweeter)—The speaker domes are attached to the speaker frames by a special cloth which is folded tangentially to permit perfectly accurate dome excursion. The cloth is also coated with two types of resins which maintain maximum suppleness and minimize temperature and humidity-related performance variations.

Polyurethane rolled edge (woofer)—The most effective edge design for optimum linearity in a large speaker cone. Also, this edge is not affected by heat, humidity or age, so that its performance remains superb indefinitely.

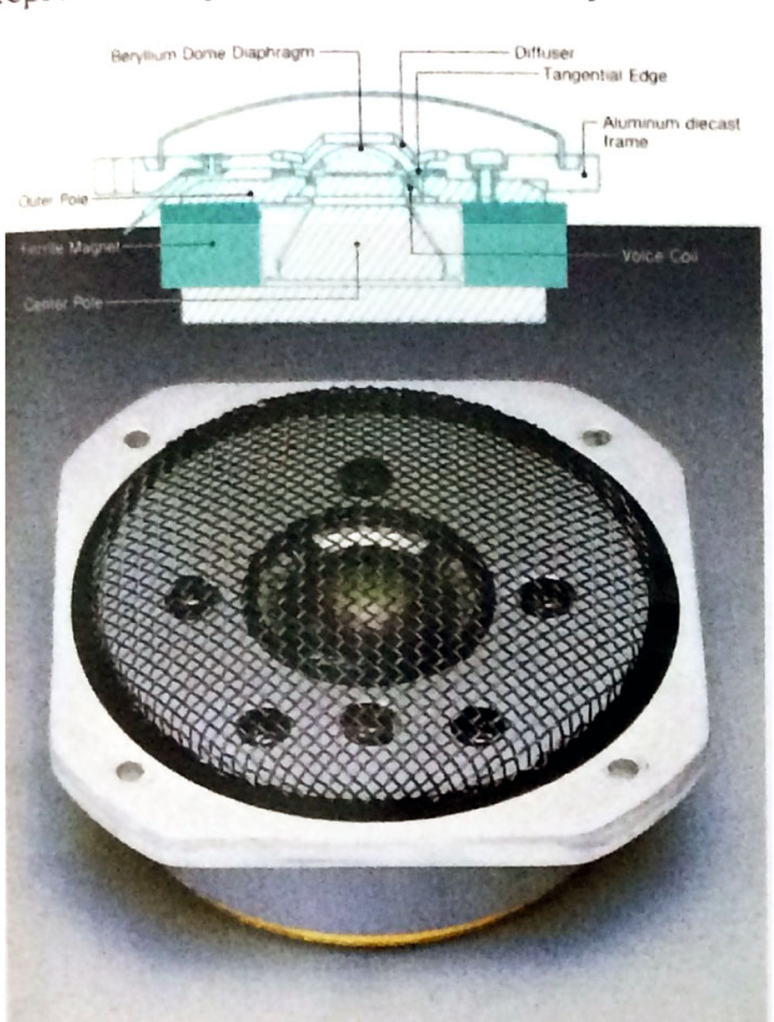
Redesigned magnetic circuitry and powerful magnets—By analyzing not only the static magnetic flux distribution but also

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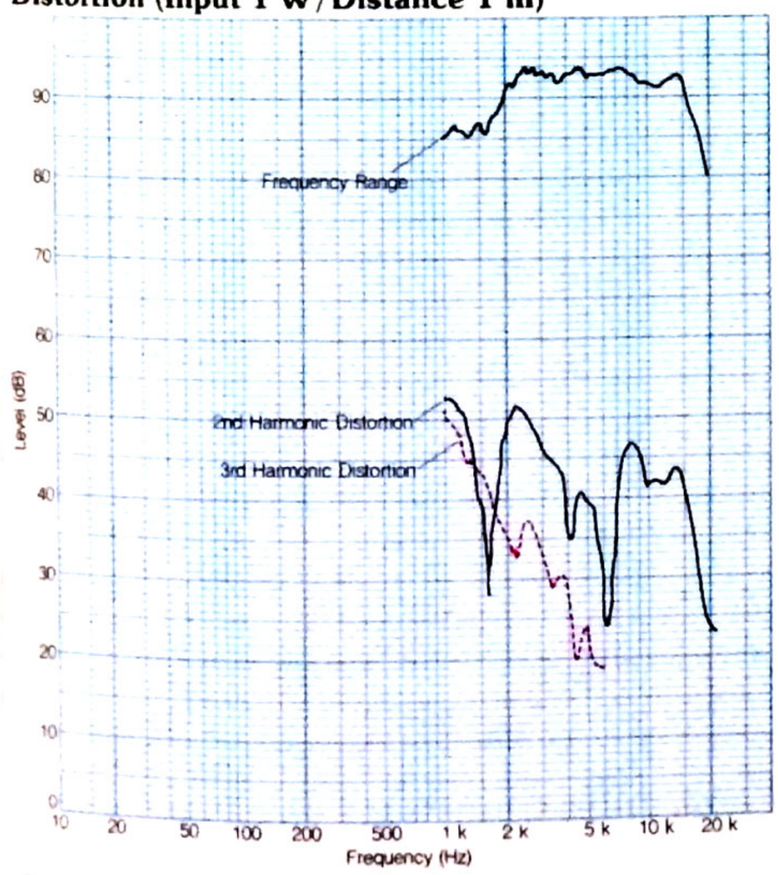
NS-2000

Natural Sound Speaker System

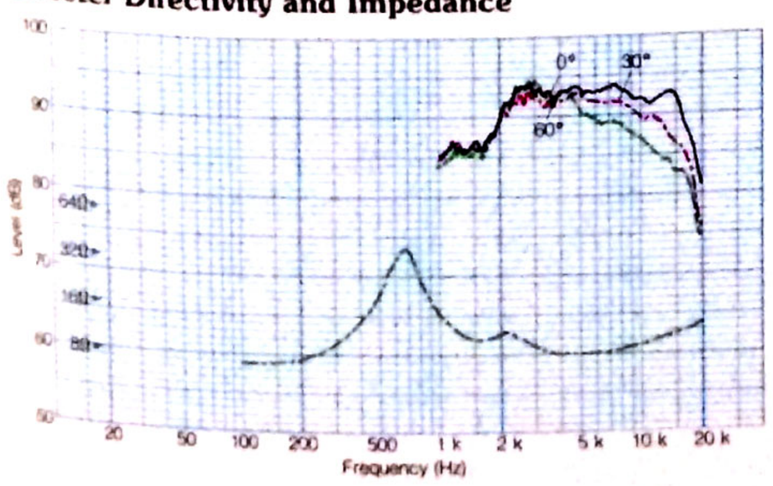
the center cap and pole, Yamaha developed a new magnetic circuit for speaker drive that virtually eliminates distortion. More powerful speaker magnets were also adopted to maximize speaker efficiency. The woofer has a massive 11,350 Gauss, 220,000 Maxwell magnet; the midrange driver has an 18,400 Gauss, 150,000 Maxwell magnet; and the tweeter puts out an 18,800 Gauss, 34,000 Maxwell field. That's power that translates into music reproduction precision and efficiency.



Tweeter Frequency Range and Harmonic Distortion (Input 1 W/Distance 1 m)



Tweeter Directivity and Impedance



Oxygen-free pure copper voice coil windings and internal wiring—Because it is free from impurities, this wire provides a purer signal path for greater reproduction accuracy. Yamaha utilizes it in the voice coil windings and all internal wiring—another reason behind the noticeably purer sound of the NS-2000.

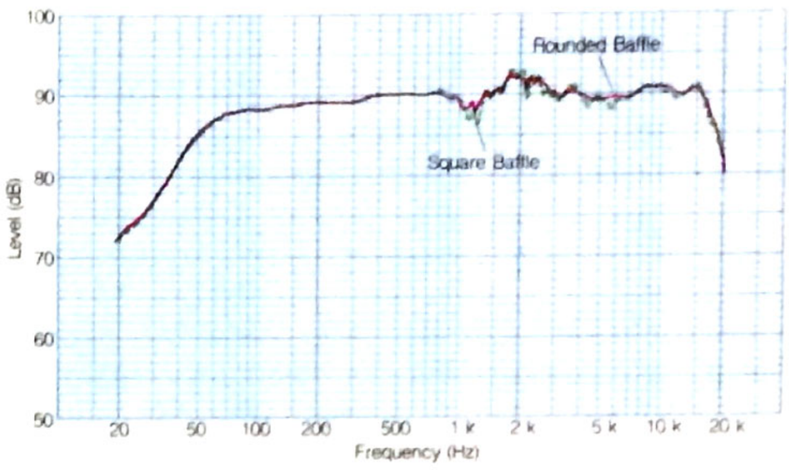
Sophisticated Enclosure

Building an acoustically superb and functionally beautiful cabinet requires expertise in two fields—audio engineering, including computer analysis of enclosure designs, and the selection and crafting of cabinet materials. Yamaha's experience and capabilities in both are second to none—and are the reason Yamaha continues to develop superior speaker systems like the NS-2000.

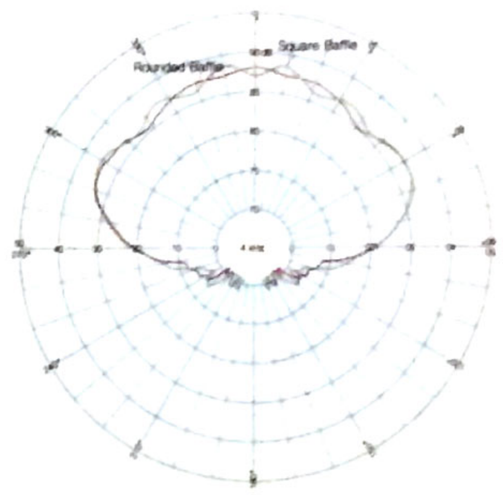
To achieve the excellent balance, dispersion, and stereo imaging possible only with the in-line center speaker arrangement, Yamaha first had to eliminate the severe diffraction-induced distortion that normally accompanies such a layout. Computer analyses of the baffle design resulted in distinctive rounded front corner section that on the NS-2000 that not only eliminate this distortion but look great, too. Just as an example of the uncompromising craftsmanship that goes into these fine speakers, the specially rounded baffle corner section are carved from solid beech to permit achievement of the precise contour, and to provide extra strength for resistance to resonance. Other analyses of the enclosure shape and frame design helped Yamaha engineers eliminate unwanted resonance throughout the speaker. With this design, Yamaha's artisans applied the company's one hundred years of experience in acoustical materials and craftsmanship to provide an acoustically and aesthetically superior cabinet. In fabrication, specially selected woods are hand-worked for maximum accuracy, then joined by Yamaha's exclusive three-way mitering technique to produce airtight, invisible joints.

The exterior of the enclosure is given a facing of beautifully finished American walnut, for looks that are as impressive as the NS-2000 sound. This painstaking attention to detail is not found everywhere. But it spells the difference between a good speaker and a truly great one. Yamaha doesn't settle for making speakers that are merely 'good'—and the NS-2000 is the result.

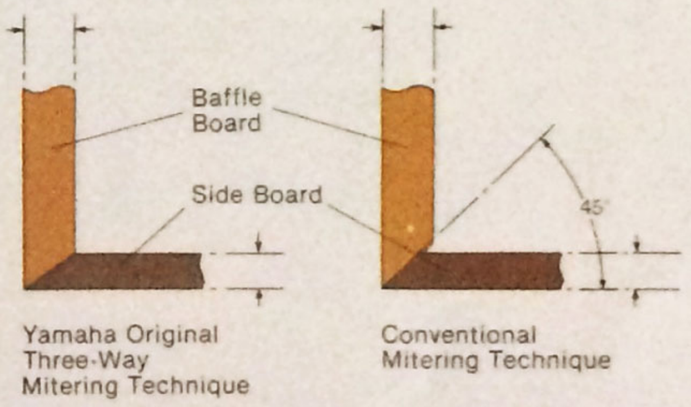
On-Axis Frequency Response



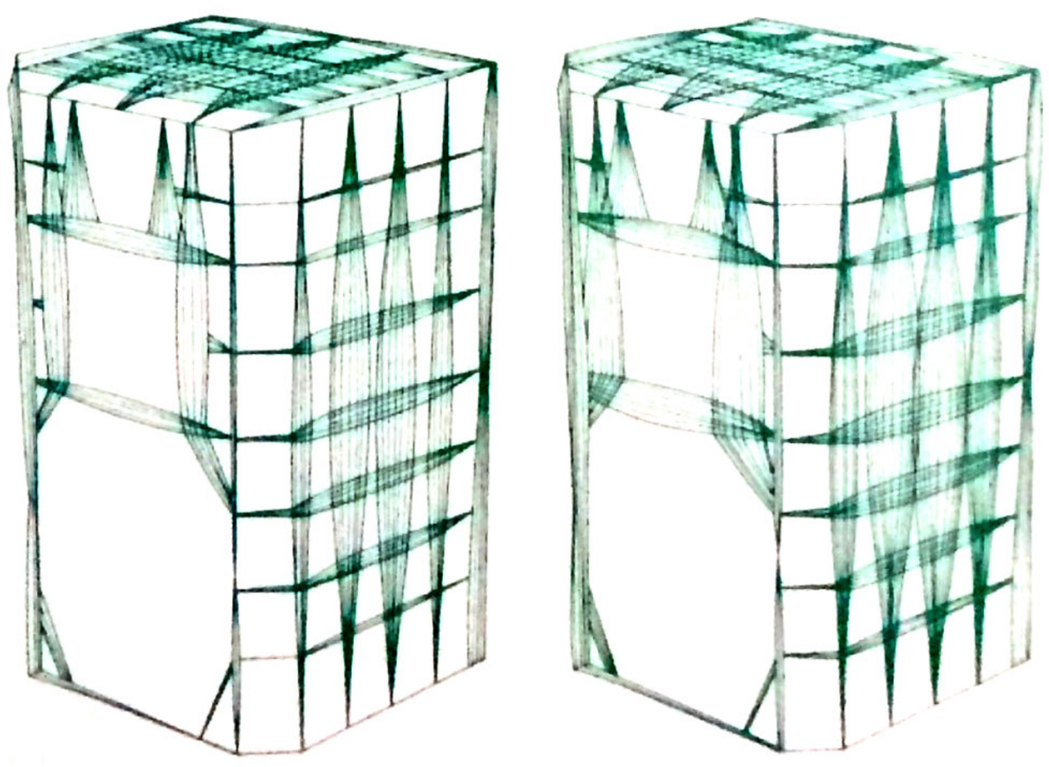
Directivity Characteristics (Rounded Baffle vs Square Baffle)



Sturdy Three-Way Mitering Technique



Modal Analysis



Well-Balanced Modal Response

Poor Modal Response (Excessive Resonance)



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NS-2000

Natural Sound Speaker System

Crossover Network

The crossover network incorporated in the NS-2000 reflects not only the latest Yamaha audio technology, but indicates the quality that can be achieved when different systems are subjected to severe listening checks as well. For example, the inductors are wound with oxygen-free copper wire, thoroughly potted, and aligned off-axis to minimize inductive coupling. All capacitors are MP types to minimize information loss. This special Yamaha system maximizes high frequency performance while minimizing phase shift.

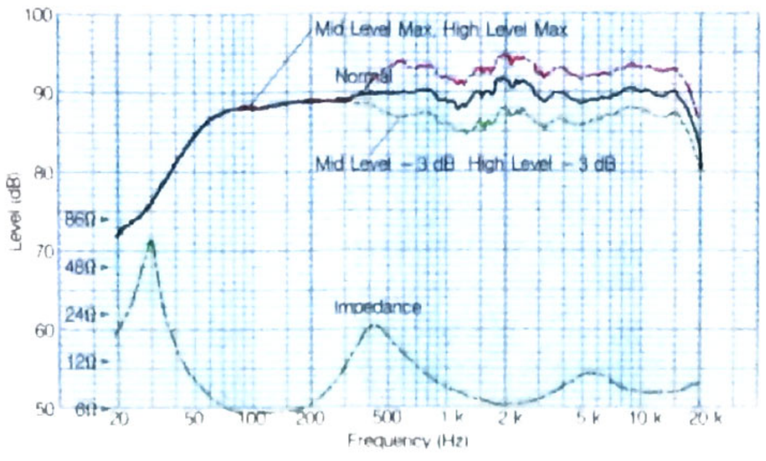


Crossover Network

Individual Midrange and Tweeter Level Controls

Since very few speaker locations provide an ideal acoustical environment, Yamaha built fine-tuning capability into the NS-2000. Independent midrange and tweeter level controls provide adjustment from +2 dB to infinity in the midrange and +3 dB to infinity in the tweeter, allowing you to enjoy the best sound in any listening situation. Further, these precision controls are specifically designed so that they cause absolutely no degradation in sound quality.

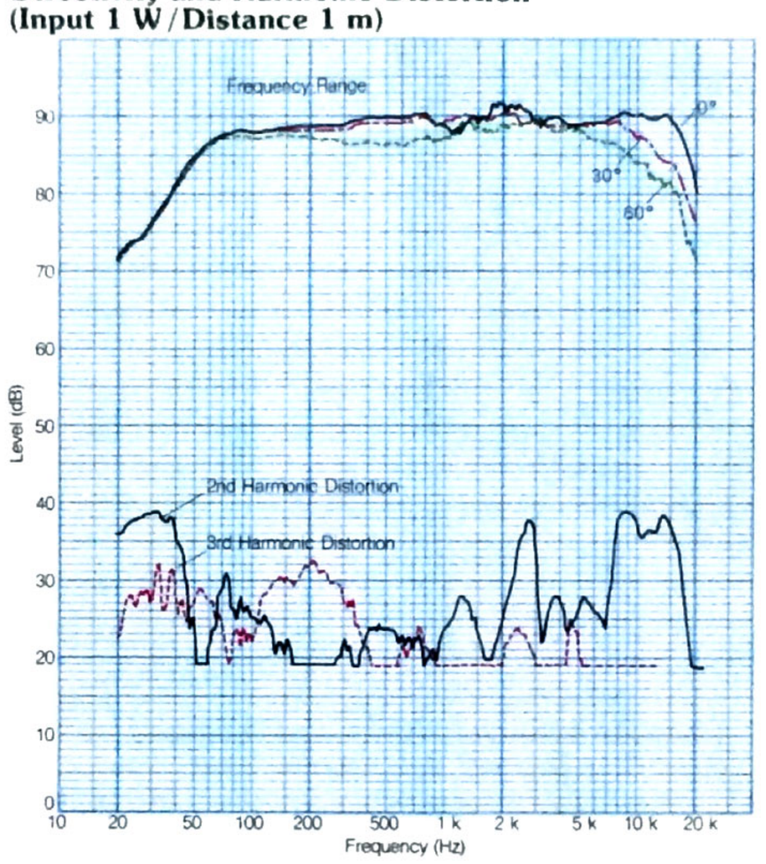
Level Control Characteristics



Yamaha Audio Technology – for Superior Overall Performance

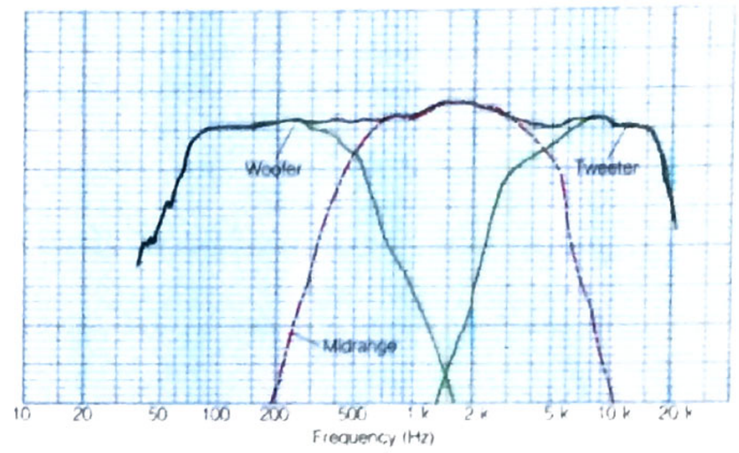
A pure carbon fiber woofer precisely reproducing the low frequencies... a midrange and tweeter with outstanding response characteristics and negligible distortion... they add up to excellent overall sound characteristics.

Directivity and Harmonic Distortion (Input 1 W/Distance 1 m)



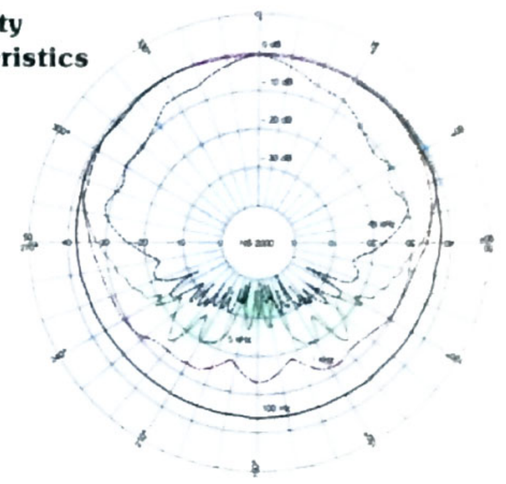
Remarkably flat power response over the entire frequency range results in consistent power output throughout the audio spectrum for more stable and efficient music reproduction.

Power Response



Deep dome construction and special acoustic diffusers on the midrange and tweeter provide excellent flat response over a broad 60° field yielding outstanding sound dispersion.

Directivity Characteristics



NS-2000 SPECIFICATIONS

Type	3-way, acoustic suspension
Speaker Unit	
Woofer	33 cm (13") pure carbon fiber cone
Midrange	8.8 cm (3-1/2") pure beryllium dome
Tweeter	3 cm (1-3/16") pure beryllium dome
Music Input Power	250 W
Nominal Input Power	125 W
Sound Pressure Level	90 dB/W/m
Nominal Impedance	6 ohms
Frequency Response	28 to 20,000 Hz
Crossover Frequencies	500 Hz, 6 kHz (– 12 dB/oct)
Dimensions (W × H × D)	440 × 752 × 404 mm
	(17-5/8" × 29-5/8" × 15-7/8")
Weight:	47 kg (103 lbs. 6 oz.)

Specifications subject to change without notice

For details please contact:

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