

Equipment profiles

Bang & Olufsen Beovox Model M 70 Speaker System

MANUFACTURER'S SPECIFICATIONS
Frequency Range: 38-20,000 Hz,
±4 dB.

Impedance: 4 ohms.

Music Load: 100 watts.

Woofer: 10 in. (25 cm).

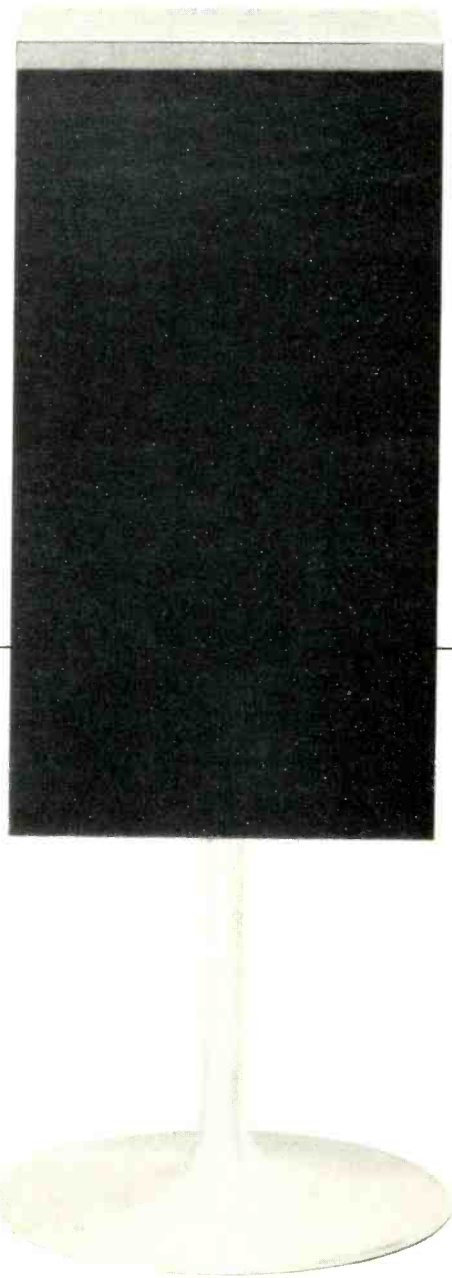
Midrange: 2½ in. (5.75 cm).

Tweeter: 1 in. (2.5 cm).

Dimensions: 13¾ in. (35 cm) x 25½ in.
(65 cm) x 11½ in. (29 cm).

Weight: 55 lbs. (25 kg).

Price: \$790.00 per pair.



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Bang and Olufsen has designed the Beovox M 70 as a quality loudspeaker, paying special attention to acoustically correct reproduction. The M 70 is a three-way system, supplemented with a special purpose speaker and crossover network intended to provide smooth phase transition in the lower crossover region. This special driver gives the system its more commonly known name of "Phase Link." In addition, all speaker units are mounted in such a way as to allow all tones to reach the listener's ear simultaneously.

A 250-mm (10-inch) woofer crosses over to a 57.5-mm (2½-inch) midrange at 500 Hz. The midrange carries the spectrum up to 4500 Hz, where it crosses over to a 25-mm (1-inch) tweeter.

The speaker enclosure itself measures only 350 X 650 X 290 mm. A metal base is supplied which lifts the M 70 such that the middle of the enclosure is 650 mm off the floor. The physical design is quite attractive, with the brushed aluminum base accenting the wood enclosure.

Here I must caution the user who may have small toddlers about. Although the enclosure weighs only 55 lbs., the center of mass is raised sufficiently high that the entire system may be readily toppled. I recommend that the unit be placed well away from the prying of small hands for safety reasons.

The Beovox M 70 is supplied with a detachable 14-foot cable which neatly plugs into the rear of the enclosure for ease of setup. However, connection to most American power amplifiers will require the purchase of a plug to adapt to the European connector.

The instruction sheet accompanying this system is small but thorough. Other than the special adaptor to match the amplifier, no difficulty should be experienced in setup.

Technical Measurements

The measured impedance of the M 70 is shown in Figs. 1 and 2. The magnitude of this impedance reaches its maximum value at around 46 Hz, but remains below 5 ohms over most of the audio spectrum. This means that

the length of the run of speaker hookup wire should be kept as short as practical and fairly large diameter wire should be used. The polar impedance plot shows a very large capacitive phase angle, on the order of 65 degrees. But since the frequency at which this occurs is below 70 Hz, this should cause no difficulty with most power amplifiers.

The one-meter axial sound pressure response is shown in Figs. 3 and 4 for amplitude and phase respectively. Both of these measurements were taken at one meter with the front grille in place, and I should point out that the grille on this

system causes internal acoustic reflections above 1 kHz. The irregularities in response at 7, 9, and 15 kHz, as well as the drop above 16 kHz, are principally caused by the effect of the grille. I recommend that if one is willing to forego the cosmetic detraction, a more accurate sound can be achieved by removing the grille entirely. However, because most users will probably not want to take such a drastic action, the response is shown with the grille in place.

The mild peak at 90 Hz together with a gradually diminishing characteristic above 250 Hz may tend to give the impression of a bass dominance to the sound when heard in a highly absorbing room. Of unusual technical interest is the nature of the phase response. The M 70 is intended to provide a smooth phase transition in crossover; measurements indicate that the spectrum above 4 kHz arrives slightly earlier than the spectrum below 4 kHz. The equivalent air path distance between these two acoustic centers is about 1.7 mm. While the sound below 4 kHz is in phase with the drive voltage, there is a 90° degree phase shift for components above 4 kHz. Technically, this essentially uniform 90-degree phase shift with constant amplitude amounts to be a Hilbert transform operation on the uppermost register. I cannot state what the psychoacoustic effect of this constant phase rotation may be or whether it is audible in the presence of other response irregularities. However, this is a practical example that phase is not just 0 or 180 degrees after we subtract the air-path delay.

The three-meter room response is shown in fig. 5. This is plotted for a microphone position directly on axis and 30 degrees off axis in a configuration in which the speaker is a left-channel of a stereo installation. The curves are displaced 10 dB for clarity.

This measurement shows that the M 70 should be angled toward the listening area for the most accurate direct sound. As in the other measurements, the grille was left in place for this test. The substantial dip at 5 kHz appears to be associated with the crossover process, since it is strongly influenced by microphone placement vertically away from this nominal position one meter off the floor. This indicates that there will be some coloration of timbre in the upper register which depends upon seating location. Some top-end boost may be necessary to restore percussive sparkle to wide dynamic range material.

Horizontal and vertical polar-energy responses are shown in Figs. 6 and 7. There is a very small amount of left-right asymmetry which will make the right channel of a stereo installation slightly more dominant unless the speakers are directed toward the listening area. The vertical response shows that sound is launched slightly upward and nearly in line with a nominal one-meter off-floor position at three meters distance from the speaker. The M 70 should not be placed directly below or to the side of substantial objects which could reflect sound back into the listening area.

Harmonic distortion for the tones of E1(41.2 Hz), A2(110 Hz), and A4 (440 Hz) is shown in Fig. 8. The M 70 is an extremely good system from the standpoint of low harmonic distortion and should sound quite clean.

The extremely low distortion of the M 70 is also shown in the measured intermodulation of 440 Hz by 41.2 Hz A4 by E1), mixed one to one. The nature of the small crossmodulation present is that of almost a pure phase modulation. At 20 average watts, the 440 Hz is phase modulated five degrees peak to peak with less than one per cent amplitude modulation by the 41.2 Hz tone. This ratio of phase-to-amplitude modulation continues up to the highest measured average power of 100 watts. All in all, the M 70 has

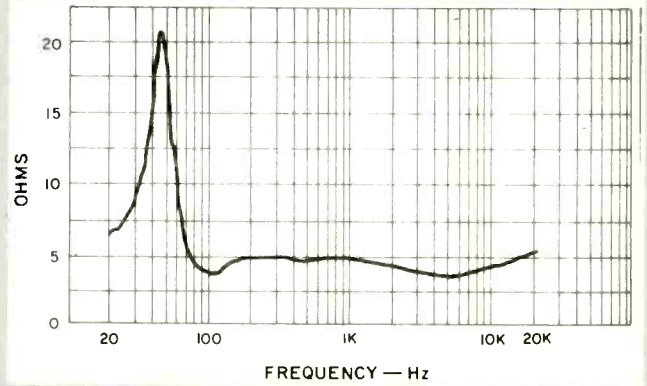


Fig. 1— Magnitude of impedance for the Beovox M70.

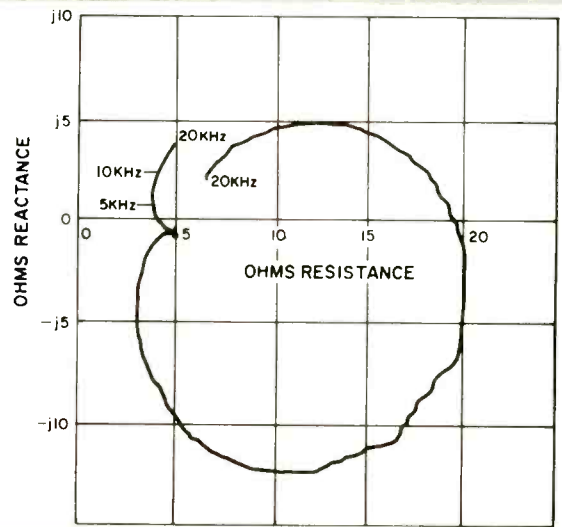


Fig. 2— Complex impedance plot.

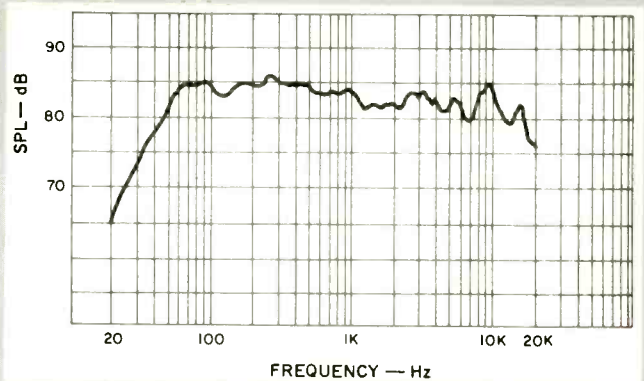


Fig. 3— Amplitude of one meter axial sound pressure level for constant voltage drive corresponding to one watt average into 4 ohms.

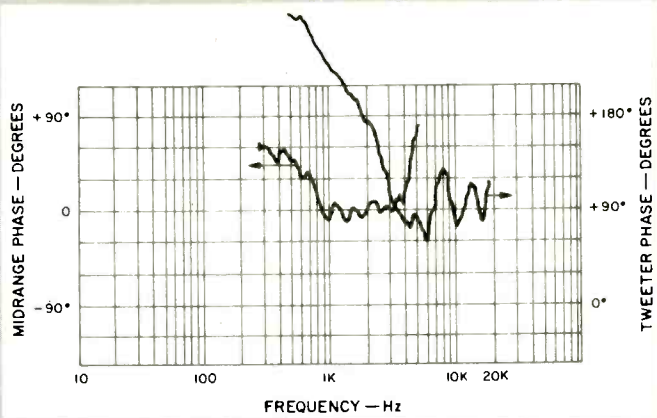


Fig. 4—One meter-axial phase response. Note scale change for the tweeter.

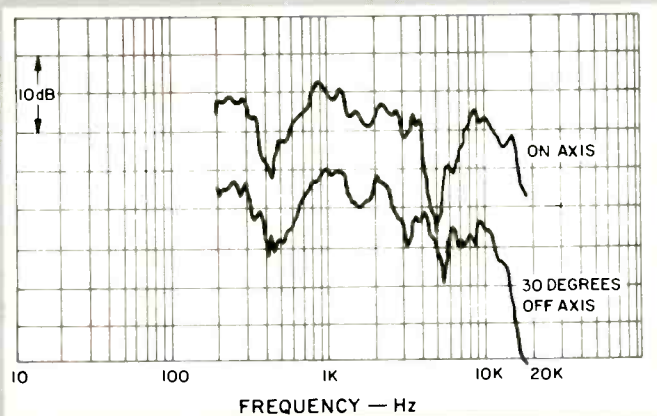


Fig. 5—Three-meter room test.

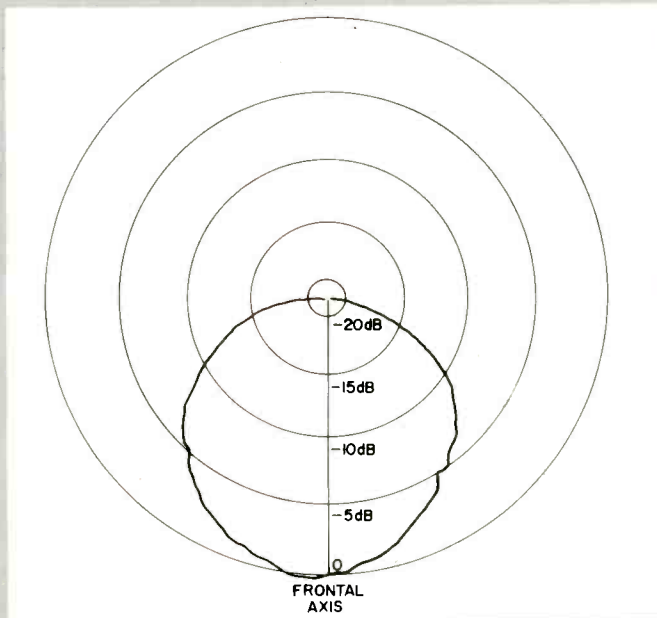


Fig. 6—Horizontal polar-energy response.

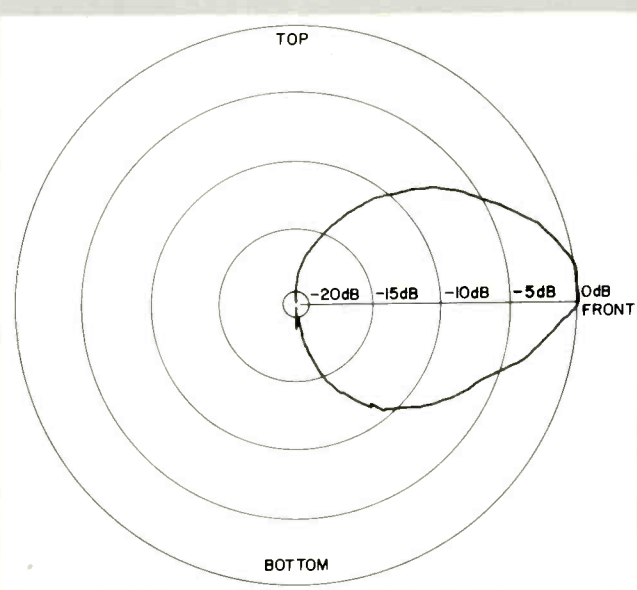


Fig. 7—Vertical polar-energy response.

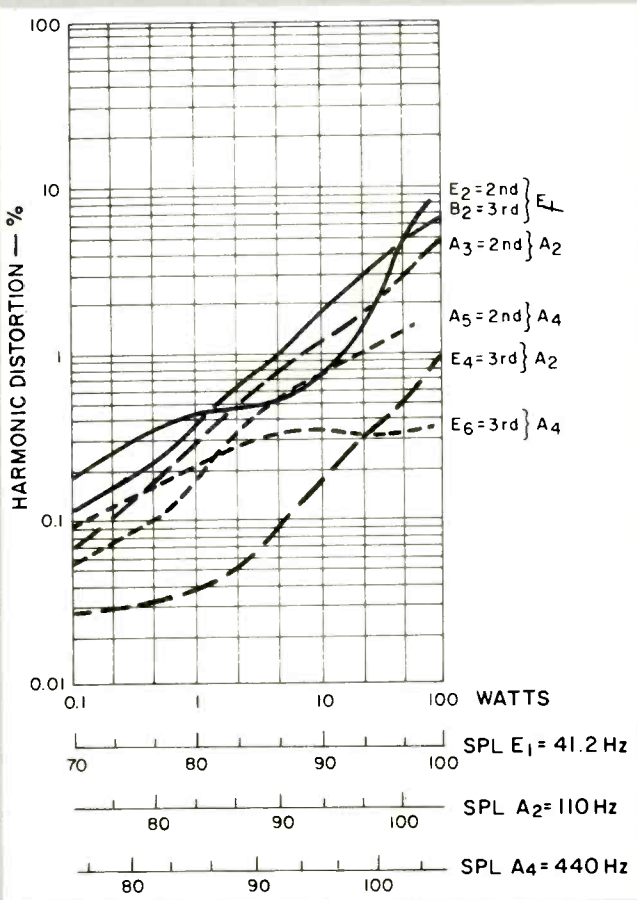


Fig. 8—Harmonic distortion for tones E_1 (41.2 Hz), A_2 (110 Hz), and A_4 (440 Hz).

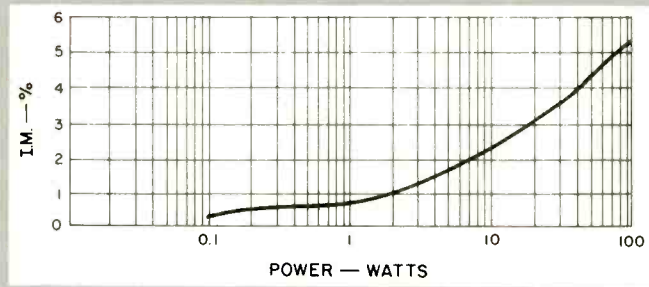


Fig. 9—IM distortion on A_1 (440 Hz) when E_1 (41.2 Hz) and A_1 are mixed one-to-one.

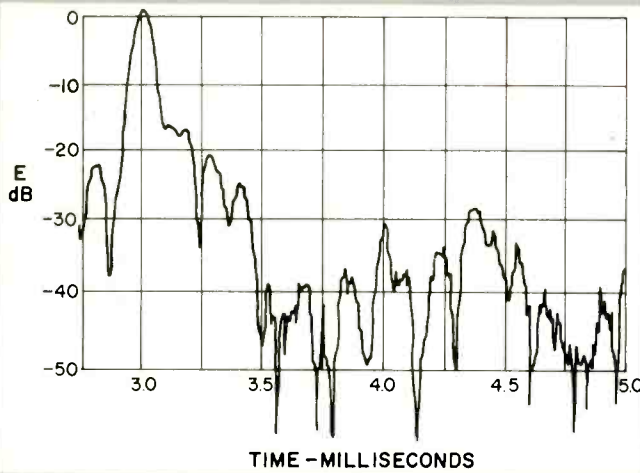


Fig. 10—Energy-time response without grille.

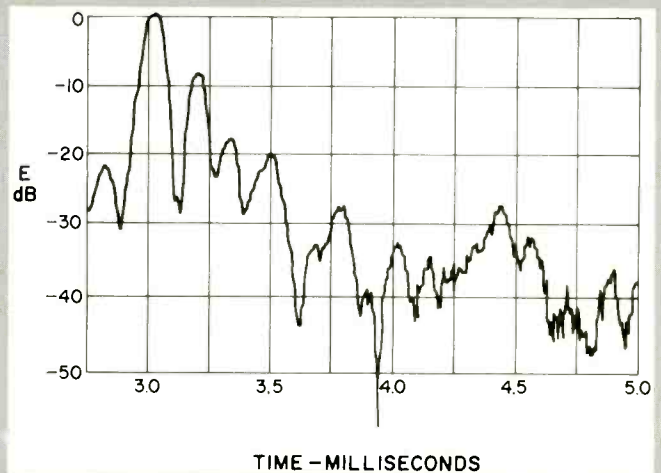


Fig. 11—Energy-time response with grille.

one of the lowest distortions of this type which I have measured.

The M 70 also measures extremely well from the standpoint of linearity of response with coherent as well as incoherent signals. The acoustic transfer gain at 20 average watts was measured to be within 0.2 dB of its value at 10 milliwatts for sample tones at 110 Hz, 262 Hz, and 440 Hz. This means that musical timbre is not dependent upon intensity over that range. The crescendo test showed less than 0.1-dB change in level of inner musical voices when noise was added at a 20-dB higher average power level, even up to peak powers of 625 watts. This is extremely good for any loudspeaker regardless of price.

Figures 10 and 11 show the measured energy-time response with and without the grille; the reverberation caused by this grille is shown by the periodic components at 3.22, 3.36, 3.5, and 3.78 milliseconds. Some minor diffraction peaks, due to enclosure geometry, are visible in both measurements and contribute a minor peak near 4.35 milliseconds. The impulse response of the M 70 can be improved by the simple expedient of removing the grille.

Listening Test

My overall impression of the M70 in the listening tests performed before measurement is that there is good bass on some instruments such as kick drum, but no super-low bass as from the lowest organ pedal notes; there is a moderately good top end which needs a progressively larger boost above a rollover of about 1 kHz to fully balance the spectrum below that point.

The sound is large, clean, and generally pleasant, but I was somewhat disappointed in the illusion of reality presented, perhaps because my expectations were too high for a system which is deliberately designed to minimize time-delay problems. Stereo lateralization is good, but, in my opinion, that elusive sense of depth is lacking, as though the music was coming from an orchestra painted on a canvas strung between the speakers. I must stress that this is a highly subjective opinion which may well be different for other listeners. Other subjective impressions were that the bass response was a bit bumpy, giving some coloration to male vocals, and that there was some upper register shrillness which I guessed was in the 2- to 5-kHz range.

Richard C. Heyser

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(Editor's Note: Bang & Olufsen informs us that "The M-70s sent to Richard C. Heyser were from an early production period, and the later samples were improved. As far as the review is concerned [which was completely fair for the sample tested and supports our own conclusions] the following changes were made:

"The Masonite backing plate for the grill caused reflections due to comparatively small speaker holes necessary to support the grill cloth. When we changed to an elastic cloth with a more open weave, the openings in the Masonite were enlarged to cover almost the whole front area of the speaker. Treble transmission was appreciably improved, and the reflections virtually eliminated." —E.P.)