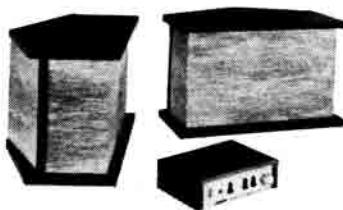


BOSE 901 STEREO SPEAKER SYSTEM



● DEPENDING on one's viewpoint, the Bose 901 speaker system might be considered a revolutionary approach to sound reproduction, or simply a workable combination of well-established (and sometimes deprecated) techniques. The Bose 901 enclosures house nine small, specially designed drivers that have 4-inch cones and powerful magnetic structures. Eight of the drivers are angled to the rear, while the ninth is mounted on the front of the enclosure facing the listening area. This arrangement is intended to achieve approximately the same ratio of direct to reflected sound that exists in the concert hall.

The 901's cabinets are quite compact, measuring $12\frac{3}{4}$ inches high by $20\frac{9}{16}$ inches wide when viewed from the front. Seen from the top, the rear of the enclosure forms a "V" of about 120 degrees. Basic to its operation is the requirement that it be mounted with the "V" facing the wall, the apex being about 12 inches from the wall. When a pair of 901's are so installed, the sound appears to be uniformly distributed across the wall between the speakers completely free of any "hole-in-the-middle" effect. Since only 11 per cent of the sound is radiated directly forward, it is almost impossible to localize the source.

An intrinsic part of the Bose 901 system is an active (ten-transistor) equalizer that handles both channels; it compensates for the high-frequency losses inherent in the reflecting process and also flattens out the bass response. (The uncompensated bass response is down because of the natural bass roll-off resulting from the very small volume of the enclosure.) Housed in a walnut cabinet $21\frac{3}{16}$ inches high by $9\frac{1}{4}$ inches wide and $6\frac{3}{4}$ inches deep, this self-powered equalizer unit is connected either between the preamplifier and power amplifier or in the tape-monitoring signal path of the amplifier or receiver. In the latter case, the amplifier's tape-monitor switch is left set to TAPE. So that the tape-monitor function would not be lost, Bose has built it into the equalizer. A tape recorder can be connected to the equalizer and the usual monitoring switching performed through it.

There are five controls on the equalizer, four rocker switches and one five-position rotary control. One rocker serves as an on-off switch, another as the tape-monitor switch, and the third as a low-cut filter that primarily

affects frequencies below 40 Hz. This is intended to reduce rumble or acoustic feedback. The fourth rocker switch interacts with a rotary five-position treble-contour control. When the rocker switch is set for NORMAL, the rotary switch provides a boost position, a flat position, and three positions of decreasing high-frequency response from the speakers. When the rocker switch is set for TREBLE DECREASE, it introduces a depression in the response between 2,000 and 6,000 Hz. The five switched contours then not only affect the very-high-frequency speaker performance, but also the frequencies between 500 and 2,000 Hz that are not affected with the rocker switch in its NORMAL position. In all, ten different high-frequency/mid-range response contours are available.

For those who have well-trained hearing and musical judgment—plus the urge to tinker—it is possible to correct for poor recordings to a remarkable degree with the equalizer controls. Most people will probably prefer to leave them in their NORMAL settings.

The active equalizer introduces no perceptible distortion. We measured its distortion at less than 0.13 per cent for any output under 3 volts, which is greater than would be required with any amplifier we know of. The output signal is of approximately the same level as the input signal.

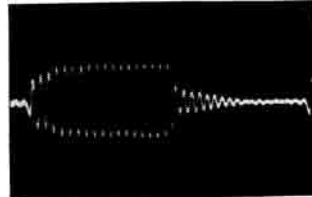
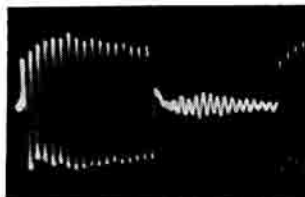
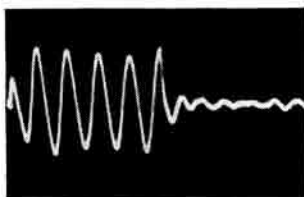
In the August, 1968 *Technical Talk* column, I commented on the difficulty of describing speaker performance in purely objective terms. The Bose 901 is a perfect illustration of this problem. After a couple of months of living with a Bose 901 system, I am convinced that it ranks with a handful of the finest home speaker systems of all time. Because of its unconventional mode of operation, I rather doubted that any frequency-response measurements I could make would account for the remarkable realism of its sound. Difficult as it is to measure the output of a single direct radiator in a normal living room, it is well-nigh impossible to measure an almost perfectly dispersed sound pattern such as that of the 901 without strong influence from the effects of room acoustics. Nevertheless, a measurement was attempted.

We placed the speaker in the recommended position relative to the wall. We did not have the equalizer in the signal path for our frequency-response and tone-burst measurements, but measured the equalizer response separately and added it to the speaker response to obtain the final curve. Ten microphone positions were used, and their readings averaged. Harmonic distortion was measured at a 1-watt drive level with the equalizer installed.

It was no surprise to find that the final response curve was not as flat as some we have measured. There appeared to be a broad rise of about 5 or 6 dB in the 130- to 250-Hz

(Continued on page 40)

The uniformly excellent tone-burst response of the Bose 901 is illustrated by the oscilloscope photos of tone-bursts at (left to right) 130, 1,000, and 9,500 Hz.



region, although we could not detect its presence by ear. The output fell smoothly above 1,000 Hz to -7 dB at 6,000 Hz, then rose to the 1,000-Hz reference level between 10,000 and 15,000 Hz.

The low-frequency harmonic-distortion measurements were affected by the speaker and microphone placement. The distortion was 7 per cent at 20 Hz, and reached maximums of 12 per cent at 30 Hz and 10 per cent at 50 Hz. It was considerably lower at other frequencies in the bass range. (As a point of reference, the better acoustic-suspension speakers have about half as much measured distortion at similar drive levels.)

We listened to the Bose 901 in several listening rooms which ranged acoustically from extremely hard and bright to quite dull. It was compared in A-B tests with several of the better speaker systems at our disposal. The Bose 901 had an utterly clean, transparent, and effortless sound. Its clarity and definition when reproducing complex orchestral passages were, in the writer's opinion, unsurpassed by any other speaker he has heard. This impression was confirmed by its tone-burst response, which was uniformly excellent across the frequency spectrum. Its low-bass response was difficult to credit to such a compact system. It had all the room-filling potency of the best acoustic-suspension systems, combined with the tautness and clarity of a full-range electrostatic speaker. The spatial distribution, which brings an entire wall alive with sound, contributes greatly to the sense of realism.

There is, unfortunately, a serious obstacle to the universal acceptance of a speaker such as the Bose 901. The 12-inch gap necessary between the apex of the speaker and the wall places the front of the speaker about 30 inches from the wall. Bookshelf mounting is generally impractical, and it may be difficult to install the 901 in the correct

location without disturbing room decor. Many potential users will be forced to decide between style and sound.

Electrically, the Bose 901 is rather inefficient, and the 18 dB of bass boost supplied by the equalizer requires huge reserves of amplifier power if loud low-frequency passages are to be played. To a lesser degree, the same problem exists at the very high frequencies. Bose recommends amplifier power ratings from 20 to 200 watts per channel, into 8 ohms. We have used it successfully with amplifiers at both ends of this range. Unlike most speakers, the 901 sounds as good at a whisper as it does at a roar, but if you are ever tempted to turn up the volume a bit, an amplifier with a continuous power rating of at least 60 watts per channel is strongly recommended. A possible compromise is to use the "below 40 Hz" roll-off in the equalizer, which reduces low-frequency peak-power requirements by 8 dB and has little audible effect. Incidentally, don't worry about overloading the 901. The individual drivers can each handle 30 watts without difficulty, and few of us are likely to be able to apply more than 270 watts to each channel.

In the final analysis, the judgment of a speaker must be subjective and personal in nature. I have, on occasion, warmly praised speakers that I considered to be outstanding performers. Everything I have said in the past is still valid. Nevertheless, at this moment, I must say that I have never heard a speaker system in my own home which could surpass, or even equal, the Bose 901 for overall "realism" of sound. My partner, Gladden Houck, concurs to the extent that he considers it a very fine system, certainly the equal of anything at or near its price. The Bose 901 system, consisting of two speaker units and the equalizer, is priced at \$476.

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