

WHAT IS HIGH FIDELITY?

By Robert J. Callen

Facsimile reproduction of sound by the recording process has long been the goal of audio engineers and to overcome the limitations, both mechanical and electrical, of recording and reproducing equipment has been their problem. Many of us in sound engineering have been repeatedly asked the question—What is High Fidelity Sound?—and in the final analysis the answer to this question is perhaps as controversial and as limited as the varying degrees of individual tastes and aural sensitivities. The Institute of Radio Engineers some years ago suggested the following simple answer to the question—“High fidelity sound recording and reproduction is the recording and reproducing of sound over a wide frequency range with a minimum of distortion. It is the reproduction of sound as the listener might imagine the original was performed.”

This definition has doubtless caused much discussion among the ranks of Audiophiles. It purposely avoided any mention of faithful reproduction which would imply the positioning of the origin of the sound. This factor is now possible with a true stereophonic sound system.

Stereophonic sound, about which we have been reading and hearing so much lately, has been with us for over twenty years. Only during the last year has it received public acceptance as an integral part of wide screen motion picture presentation. There is no doubt that the positioning and scope of the sound by means of stereophonic reproduction adds immeasurably to the audience entertainment value in the theater. Ample proof of this statement can be had by watching Cinerama and listening first with both ears, then with one ear at a time and finally without sound. Stereophonic sound is indeed a full fledged partner of wide screen pictures and not just an adjunct to the picture as monaural sound was considered to conventional picture presentation over the past quarter century.

In 1877 when Thomas A. Edison listened to a reproduction of his voice reciting “Mary Had a Little Lamb” which he had embossed on a tin foil surface wrapped on a small cylinder, he opened many avenues of present day enterprise. He, himself, was not aware of the vast possibilities of his invention



Dr. Lee DeForest and the author, Robert J. Callen beside the Hi-Fi “ab” Comparison panel in the sound room of Penny-Owsley Music Co.

for he first considered the phonograph as a toy to be played in the nursery. It remained for other inventors to realize the commercial possibilities and to improve the performance of the phonograph.

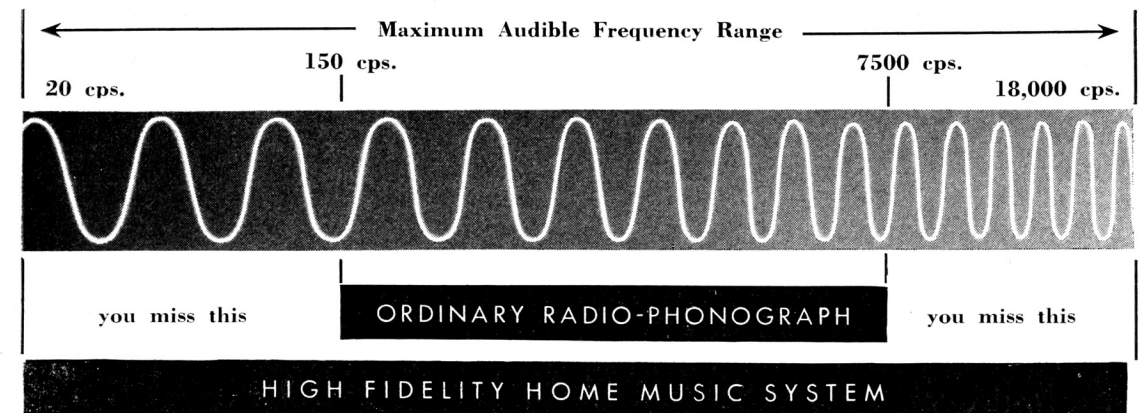
By the first quarter of the twentieth century the manufacture of phonographs and records had become big business with the Edison Company one of the four major companies. By 1924 it was estimated that there were more than fifteen million Victrolas in American homes. At that time the Bell Laboratories announced the completion of the first truly engineered “Orthophonic” phonograph. It consisted chiefly of a well designed leverage system which coupled the phonograph needle to a diaphragm. This diaphragm was coupled through an air column to a large wooden exponential horn.

When this new Orthophonic phonograph was demonstrated to the Victor Talking Machine Co. board of directors they were pleased with its clarity of tone and increased volume but they had one criticism—“It just didn’t sound like a talking machine!”

It seemed inevitable that twelve years after Mr. Edison invented the phonograph his associate, Mr. Dickson should combine it with the Motion Picture, which Mr. Edison also invented, to produce the first sound motion picture. Difficulties with synchronization and control of sound volume seemed to make this first sound picture commercially impractical.

In 1907 Dr. Lee DeForest patented the Audion which removed the chief barrier to the recording and reproduction of High Fidelity sound. With the Audion and the vacuum tube which followed it became possible to amplify and control the volume of sound. After five years of failure to interest any commercial enterprise in developing his Audion, Dr. DeForest finally succeeded in convincing Dr. Arnold of the Bell Laboratories of the value of his invention. In 1913 he sold the Audion and all rights thereto, to the Western Electric Company. Eleven years later the Bell Telephone Laboratories produced their first sound motion picture depicting Western Electric manufacturing techniques. This was shown at a

COMPARISON HIGH FIDELITY and ORDINARY PHONOGRAPH



Male voice: 100 to 8,300 cycles	Gong: 300 to 15,000 cycles	Violin: 190 to 15,000 cycles	Trumpet: 164 to 9,500 cycles
Female voice: 170 to 10,000 cycles	Oboe: 283 to 15,000 cycles	Xylophone: 130 to 15,000 cycles	English Horn: 164 to 8,500 cycles
Bass clarinet: 80 to 15,000 cycles	Organ: 29 to 15,000 cycles	Clarinet: 146 to 14,500 cycles	French Horn: 90 to 8,200 cycles
Castanets: 500 to 15,000 cycles	Piccolo: 587 to 15,000 cycles	Bassoon: 58 to 14,000 cycles	Trombone: 80 to 8,000 cycles
Cello: 65 to 15,000 cycles	Snare drum: 80 to 15,000 cycles	Cymbals: 300 to 14,000 cycles	Tuba: 41 to 7,500 cycles
Chimes: 523 to 15,000 cycles	Saxophone: 55 to 15,000 cycles	Viola: 130 to 11,000 cycles	Piano: 30 to 6,500 cycles
Flute: 261 to 15,000 cycles	Tambourine: 500 to 15,000 cycles	Celesta: 261 to 10,000 cycles	Bass Drum: 52 to 5,500 cycles
Glockenspiel: 784 to 15,000 cycles	Triangle: 500 to 15,000 cycles	Double Bass: 40 to 9,500 cycles	Tympani: 45 to 4,500 cycles

banquet for company executives in January 1924. The later history of sound in motion picture presentation is well known to our readers it having become a commercial reality in 1928 when Warner Bros. startled the entertainment world with their first sound picture starring the late Al Jolson entitled “The Jazz Singer.”

By this time the art and science of sound recording and reproduction was well on its way. With the development of recording techniques, first on discs, then the photographic sound track followed by magnetic recording on steel

wire to the present magnetic recording on film coated with a ferrous oxide emulsion, there has been a constant improvement in the various electronic components used including microphones, amplifiers, tuners, loud speakers, disc pickup heads, filters and equalizers. Adding all these factors together plus the universal stimulation to the appreciation of good music through the impetus of radio, television and musical pictures, it is inevitable that sound hobbyists, known as Audiophiles, should seek and acquire for their personal

satisfaction and entertainment, the newest and the best of equipment for High Fidelity reproduction of their favorite music and artists. Thus has come into being the fraternity of Hi-Fi enthusiasts. Don’t scoff when you see that gleam in their eyes as they rapturously listen to their latest acquired recording or proudly display their new loud speaker system with a four way dividing net work. You too may be on the verge of becoming one yourself—and incidentally—I can think of many worse ways to spend your time and money.

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