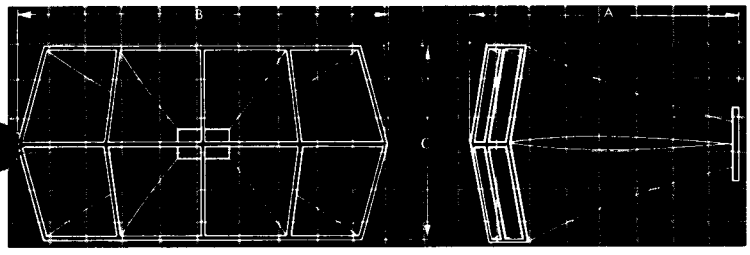

ALTEC ENGINEERING NOTES

TECHNICAL LETTER NO. 231

THREE NEW COMPRESSION DRIVERS

By

Mark E. Engebretson and W.L. Hayes

For many years, the Altec 288 has been acknowledged as the finest compression driver available for full-range sound reproduction in motion picture theatres. More recently, the Altec 291-16A driver has been comarketed with the 288C, embodying many similar performance characteristics, but with a higher power-capacity rating. The Altec 290 was designed for high-powered, all-weather speech reinforcement system applications where conversion efficiency and power capacity considerations were paramount.

An engineering project was started in November, 1971, with the specific goal of improving the performance of these products. A wide range of driver structures were evaluated during the research phase of the project, ranging from 1.75-inch to 4-inch driver voice coil assemblies. Competitive products from DuKane, Electro-Voice and JBL were also evaluated. Research confirmed that the 2.8-inch voice coil assembly currently in use was the largest practical diameter that could maintain frequency response to 15 kHz.

During the product development phase, design consideration was focused on improving magnetic structures and diaphragms, with performance goals directed toward improving sensitivity and frequency response.

288 DRIVERS

The magnetic assembly used in the 288C is capable of producing a gap flux density of 18,500 gauss. The structure is a machined part, fabricated from seamless tubing. The magnet is Alnico V, and weighs 3.42 pounds. The new 288-8G and 288-16G will employ a cast pot structure, housing an Alnico V magnet weighing 6.49 pounds. The gap flux density of the new products has been increased to 20,500 gauss, resulting in a sensitivity improvement of 2 dB.

The diaphragm/voice coil assembly has been redesigned to allow for lower mass, resulting in response improvements above 10 kHz. Additionally, the new product will employ adjustable dowel pins to allow each voice coil to be precisely centered in the voice coil gap. Finally, two products will be offered in the 288 series; one 8-ohm and one 16-ohm **minimum-impedance** driver, designated 288-8G and 288-16G.

Figure 1 compares the performance of an Altec 288-8G with the JBL 2440 driver.

The pink-noise power capacity of both drivers averaged 15 watts for four samples tested (see Altec Technical Letter No. 230).

Note that the impedance of the JBL driver drops 2 dB **below** 16 ohms. This will result in an apparent increase in sensitivity in a direct A-B comparison; however, sensitivity comparisons must be made on a watt-for-watt basis if meaningful field comparisons are to be made.

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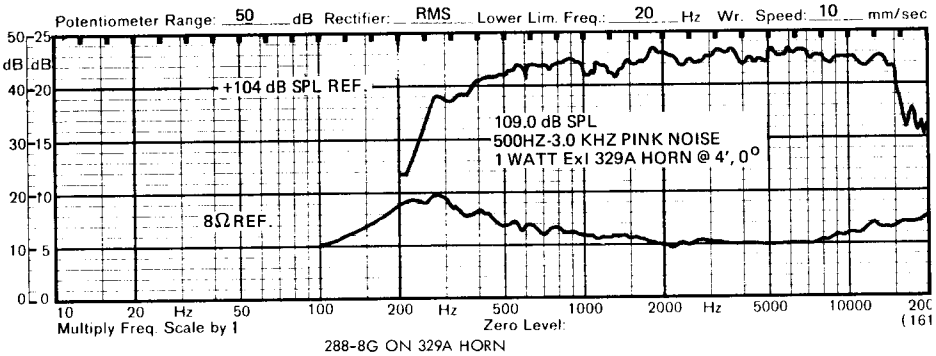
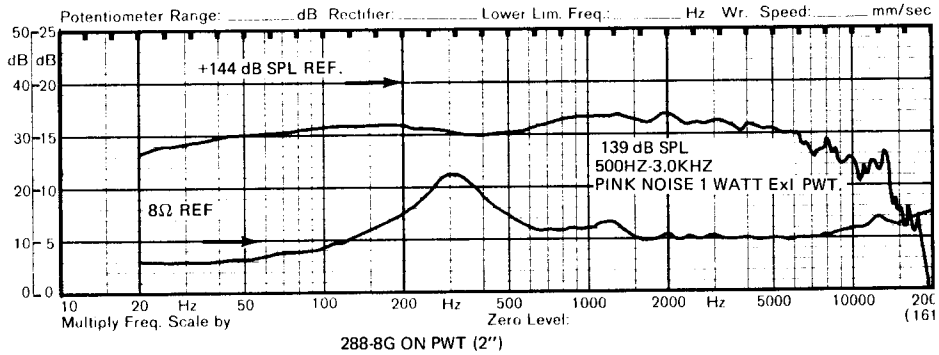
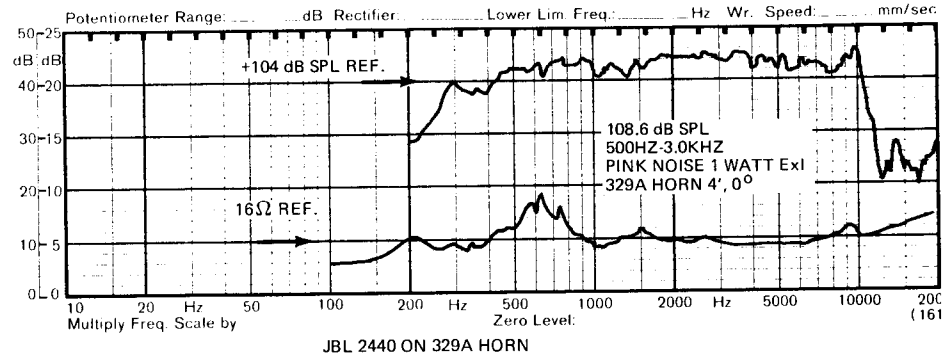


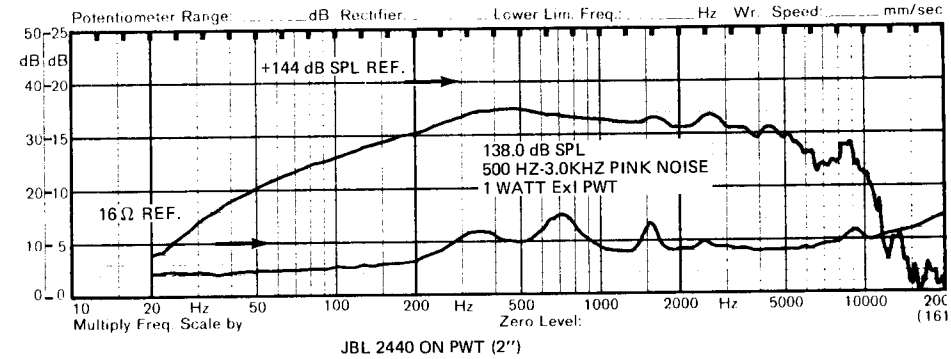
288-8G ON 329A HORN



288-8G ON PWT (2")



JBL 2440 ON 329A HORN



JBL 2440 ON PWT (2")

Figure 1. Comparative Performance, Altec 288-8G vs. JBL 2440

The plane-wave tube response curve provides useful acoustic power vs. frequency information, since the effects of a changing directivity factor with a horn are nullified.

291-16B DRIVERS

The new 291-16B driver will incorporate the same magnetic changes previously discussed for the 288-8G/288-16G drivers, resulting in a 2 dB sensitivity increase. HF diaphragms will also incorporate the adjustable dowel pin centering technique. Figure 2 shows the frequency response of the 291-16B mounted on an Altec 329A horn. Note that the response extends to 13 kHz; however, at a somewhat reduced level from the 288-8G/288-16G drivers above 8 kHz because of the increased mass required to ensure the 40-watt pink-noise power capacity.

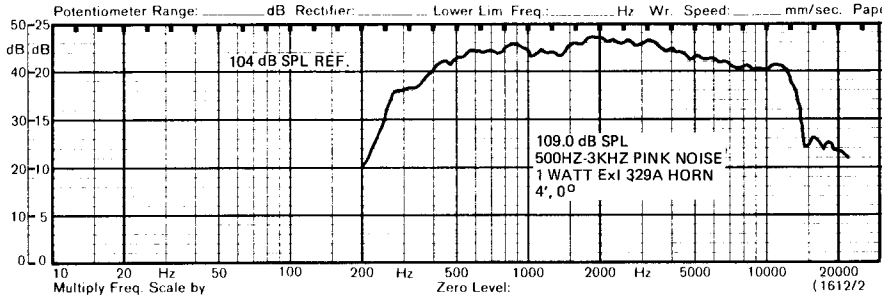
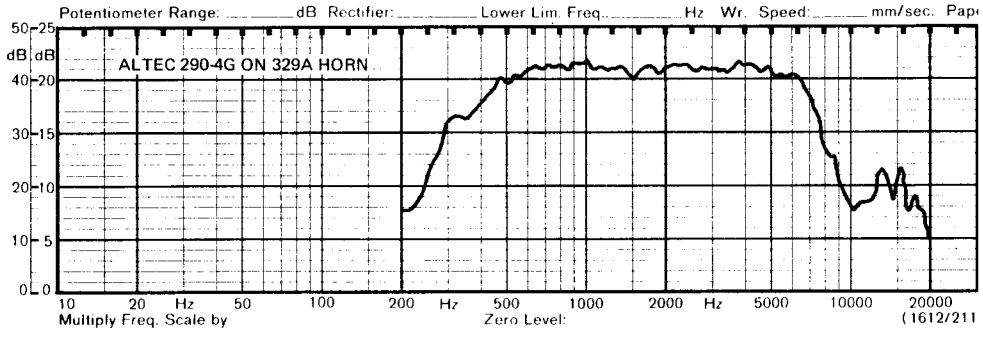


Figure 2. Performance of 291-16B HF Driver on 329A Horn

290-4G DRIVER

The 290-4G driver employs a magnetic assembly similar to the aforementioned new products; however, due to the gap widths required by the high-power phenolic structure, gap flux density is 18,500 gauss. Improvements in top plate and phasing plug designs have allowed the 290-4G to exhibit a more uniform response characteristic over the 500 Hz to 7 kHz band. Overall, sensitivity has been improved 2 dB. The 290-4G also employs adjustable dowel pin centering. Figure 3 compares the Altec 290-4G with the JBL 2482. Note the extended high-frequency response of the 290-4G.



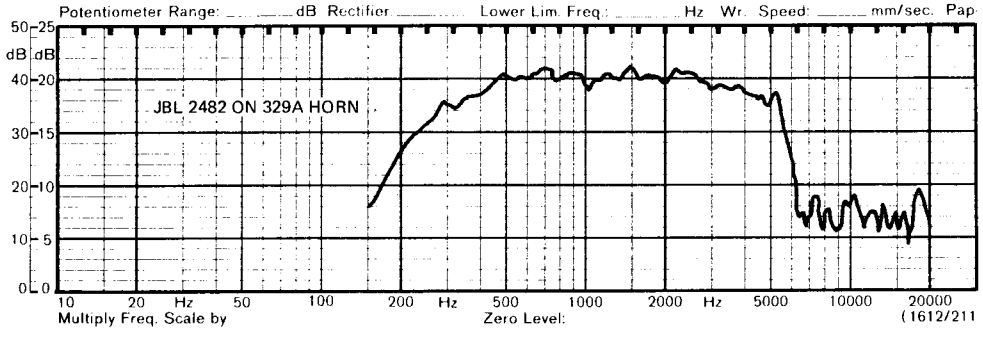


Figure 3. Comparative Performance, Altec 290-4G vs. JBL 2482

SUMMARY

These new products represent the finest compression drivers presently available for commercial and professional applications.

New quality control equipment and procedures will ensure compliance with the laboratory prototype data presented herein, and minimum variations on an item-for-item production basis.

Table I details the performance of these new drivers on Altec horns typically specified for commercial applications. This table is intended to replace Technical Letter No. 203 when the new products become available.

Table I. Field Sensitivity Measurements

Driver	Horn	Electrical Input Power (1)	SPL at 30 Ft.	SPL at 10 Ft.	SPL at 4 Ft. (2)
288-8G/ 288-16G	203B 203B	15 watts 1 watt	108.0 dB 96.0 dB	117.5 dB 105.5 dB	125.5 dB 113.5 dB
290-4G	203B 203B	100 watts 1 watt	112.5 dB 92.5 dB	122.0 dB 102.0 dB	130.0 dB 110.0 dB
291-16B	203B 203B	40 watts 1 watt	112.0 dB 96.0 dB	121.5 dB 105.5 dB	129.5 dB 113.5 dB
288-8G/ 288-16G	311-60 311-60	15 watts 1 watt	108.0 dB 96.0 dB	117.5 dB 105.5 dB	125.5 dB 113.5 dB
290-4G	311-60 311-60	100 watts 1 watt	112.5 dB 92.5 dB	122.0 dB 102.0 dB	130.0 dB 110.0 dB
291-16B	311-60 311-60	40 watts 1 watt	112.0 dB 96.0 dB	121.5 dB 105.5 dB	129.0 dB 113.0 dB
288-8G/ 288-16G	311-90 311-90	15 watts 1 watt	104.5 dB 92.5 dB	114.0 dB 102.0 dB	122.0 dB 110.0 dB
290-4G	311-90 311-90	100 watts 1 watt	109.0 dB 89.0 dB	118.5 dB 98.5 dB	126.5 dB 106.5 dB
291-16B	311-90 311-90	40 watts 1 watt	108.5 dB 92.5 dB	118.0 dB 102.0 dB	126.0 dB 110.0 dB
288-8G/ 288-16G	329A 329A	15 watts 1 watt	104.5 dB 92.5 dB	114.0 dB 102.0 dB	122.0 dB 110.0 dB
290-4G	329A 329A	100 watts 1 watt	109.0 dB 89.0 dB	118.5 dB 98.5 dB	126.5 dB 106.5 dB
291-16B	329A 329A	40 watts 1 watt	108.5 dB 92.5 dB	118.0 dB 102.0 dB	126.0 dB 110.0 dB
288-8G/ 288-16G	803B 803B	15 watts 1 watt	106.5 dB 94.5 dB	116.0 dB 104.0 dB	124.0 dB 112.0 dB
290-16B	803B 803B	100 watts 1 watt	111.0 dB 91.0 dB	120.5 dB 100.5 dB	128.5 dB 108.5 dB
291-16B	803B 803B	40 watts 1 watt	111.0 dB 94.5 dB	120.5 dB 104.0 dB	128.5 dB 112.0 dB
288-8G/ 288-16G	1003B 1003B	15 watts 1 watt	104.5 dB 92.5 dB	114.0 dB 102.0 dB	122.0 dB 110.0 dB
290-4G	1003B 1003B	100 watts 1 watt	109.0 dB 89.0 dB	118.5 dB 98.5 dB	126.5 dB 106.5 dB
291-16B	1003B 1003B	40 watts 1 watt	108.5 dB 92.5 dB	118.0 dB 102.0 dB	126.0 dB 110.0 dB

(1) The input signal is pink noise, band-limited to pass frequencies from 500-3000 Hz. Electrical input is based on rms voltage times rms current.

(2) Due to the physical size of the horns measured, all readings are based on free-field measurements, taken 10 feet from the mouth of the subject horn. Four-foot ratings were then **calculated**, to reduce the possibility of near-field error.