



ALTEC "Voice Of The Theater" Speakers For Hi-Fi

by Jeff Markwart
and John Tucker

Several years ago, while auditioning components for an overall system upgrade, Bill Fisher of Friendswood, Texas, suggested that I consider horn loaded speakers. The following weekend, he gave me a demo of his classic Altec Lansing A7-500W-1 Magnificents. The Magnificents are a furniture cabinet version of the A7 small "Voice of the Theater" system with a 500 Hz horn.

It was immediately apparent that these imposing boxes did a number of things very well compared to the majority of speakers I had been evaluating. Positive characteristics included:

- huge, effortless dynamics
- fast, controlled midrange transient response
- dramatic presence
- midrange clarity
- natural, open sounding bass
- high efficiency

I was hooked. Before long there was a pair of A7-500 Utilities in my front room running on a pair of 6B4-G push-pull triode monos I built. John Tucker stopped by for a listen and soon Altecs appeared at his house also. Over time, however, John and I became aware of a number of shortcomings inherent in the stock A7. These included:

- midrange and treble distortion on program peaks
- treble ringing
- lack of soundstage/imaging
- lack of clean bass
- lack of deep bass
- lack of system balance at lower SPLs
- crossover region colorations
- requirement for a low system noise level

The following paragraphs suggest some practical remedies for these limitations. We were impressed with the results of our

experiments but we feel they only approach the limit of potential improvement. Some of these recommendations will not be appropriate or cost effective in commercial applications. Many of these recommendations apply to other Altec systems. Our goal was to optimize the A7 for full range, hi-fidelity use in relatively small, quiet, environmentally controlled spaces.

NOISE, NOISE, NOISE!

A7s are extremely efficient. The typical A7 has a pressure sensitivity of 105 dB SPL (1W/1M). You may discover your system noise floor is clearly audible through this speaker. Hum must be 1-2 mV or less for woofer inaudibility; even less if there is any non-sinusoidal component. The compression driver can reproduce thermal noise in its bandpass quite readily, and this may have to be reduced so as not to be intrusive in a

quiet room (40-45 dBA). The following steps may be useful in achieving an acceptably low system noise level:

- use main amplifiers that have less than 1-2 mV of hum at their output with the input grounded
- eliminate system ground loops
- eliminate unneeded gain stages
- use stepped attenuators
- for unbalanced terminations, employ interconnects that use a shield as a drain
- upgrade stock speaker wiring, crossover wiring, and connectors
- upgrade stock internal wires between the compression driver binding posts and the diaphragm voice coil terminations
- clean all signal connection mating surfaces

These steps should result in greater usable dynamic range, lower harmonic distortion, an increase in low level program information, and better imaging. You promised to do this years ago, anyway, right?

WHICH WAY IS UP?

The speaker can either be configured "inverted", with the H.F. horn mounted in the cabinet reflex port and the short bass horn closest to the floor, (Magnificent, A7-W, some Utilities - Fig.2), or "upright", with the H.F. horn on top of the cabinet and the reflex port closest to the floor (Fig.1). If the

ALTEC A7 Systems

PERFORMANCE SPECIFICATIONS:	A7 SYSTEM	A7-500 SYSTEM
Power Rating:	30 watts	30 watts
Impedance:	16 ohms	16 ohms
Horizontal Distribution:	90 Degrees	90 Degrees
Vertical Distribution:	40 Degrees	40 Degrees
Frequency Response:	35-22,000 cps	35-22,000 cps
Pressure Sensitivity:	109.2 db (w/1 watt input at 4')*	109.2 db (w/1 watt input at 4')*
	124 db (w/30 watts input at 4')	124 db (w/30 watts input at 4')
Crossover:	800 cps**	500 cps***
Dimensions:	42" H } LF Horn 30" W } Only 24" D }	54 1/4" H 30" W 24" D
Finish:	Theatre Gray	Theatre Gray
Weight:	100 lbs. (Cabinet)	135 lbs. 142 lbs.

* 109.2 db measured 4' from mouth of horn over warble frequency range 500-2,500 cps. (Ref: .0002 dynes/cm² for 1 watt input.)

** N-800D furnished; Adjustable in 4 steps of 1db *** N-500 D furnished; Adjustable in four steps of 1.5 db

H.F. horn is removed from the port for upright mounting, the reflex port area must be reduced from approximately 375 to 220 square inches. The upright configuration is superior for bass projection and tightness, overall imaging, and a seamless blending of the drivers.

CAUTION: DIPS AHEAD

Each speaker requires crossover phase alignment of its two drivers for lowest distortion and best imaging. Altec recommends locating this point by: 1) positioning the driver voice coils in basic vertical alignment and then, 2) adjusting the H.F. driver/horn position (connected electrically out of phase from the woofer) to achieve the greatest observed dip at crossover on a real-time analyzer measuring speaker reproduced pink noise. A dip of 6-8 dB should be attainable. Reverse the H.F. connections when you finish securing the horn and the drivers will be in-phase at crossover.

ACOUSTIC MUD & OTHER FINDS

The stock bass cabinet contributes significant amounts of unwanted acoustic energy to program material. Reduce these vibrations by stiffening the box with external veneers or laminates and adding internal panel bracing of 2X2s or 2X4s glued and screwed on edge. Dampen the internal flare of the short horn with contractor's epoxy, tar, insulating foam, or other suitable material. Install braces between the short horn flares and the sides of the box. Brace the port boards with diagonal hardwood 1X2 glued and screwed on edge. These actions will eliminate the muddying distortions caused by cabinet radiations in the mid and upper bass.

Altec cast aluminum horns ring like the Liberty Bell. They need to have damping material applied to their exteriors until a knuckle rap produces only a "thunk". Use tar, Soundcoat, layers of latex paint over sand, lead, sand filled enclosures, or other suitable material. This will eliminate the treble ringing of the H.F. horn that is a major source of listener fatigue.

All air leaks in the box should be sealed. A common problem seen in many older boxes is a gap that appears along the bottom edge of the short bass horn flares.

SO MANY CHOICES, So Little Time

There are two basic families of compression drivers applicable to the A7 — the small 1" throat type and the larger 1.4" variety. The

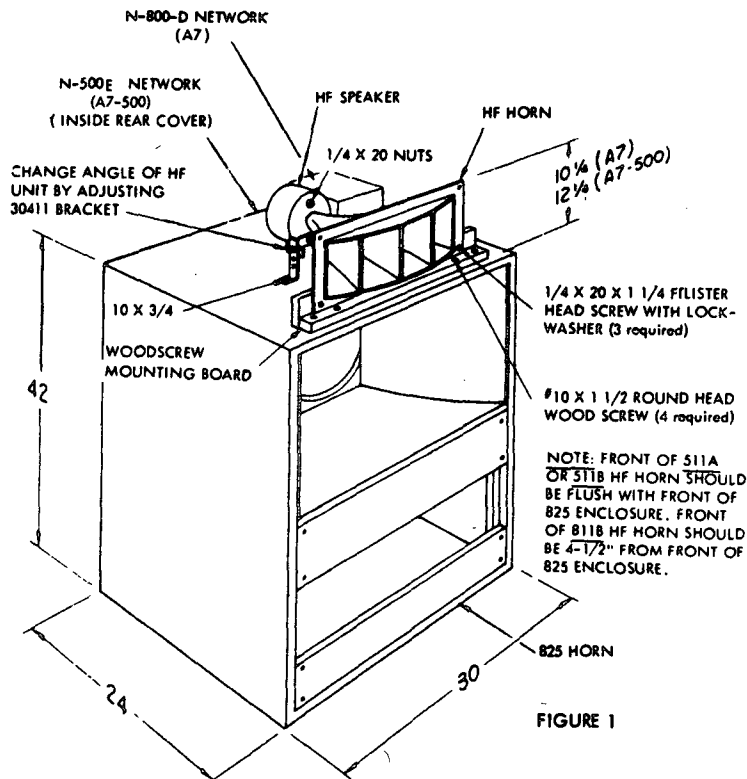


FIGURE 1

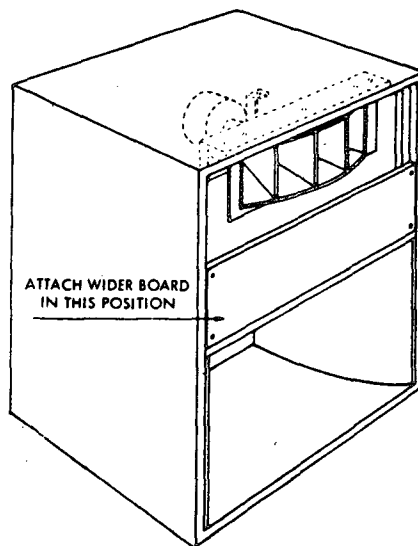


FIGURE 2

UPRIGHT AND INVERTED A7 CONFIGURATION

one inch family includes the 802, 804, 806, 807, 808, 902, 908, and 909. The one and a quarter inch type can be either a 288, 291, or a 299. There have been many cosmetic and performance changes over the years in both families.

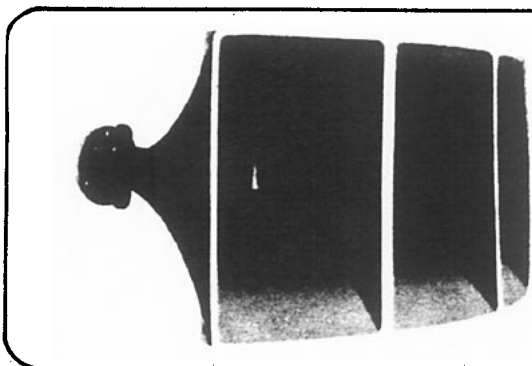
Generalities:

- Older units (pre 1980) use Alnico magnets; later units use ferrite
- Older units (pre 1977-79) use a machined metal phasing plug; later

units use the plastic "Tangerine" phasing plug

- Older units have a bronze throat screen attached to their mounting gasket; later units have a bronze or stainless screen sandwiched between the phasing plug and throat
- The 1 inch drivers bolt to the 511 or 811 sectoral horn directly; an adaptor is required to connect 1 inch drivers to larger sectoral, multicellular, or constant directivity horns designed for 1.4 inch drivers

ALTEC 311-60 AND 311-90 SECTORAL HORNS



The Altec 311-60 and 311-90 are the newest sectoral horns in the Altec line. They are designed for use in sound systems where a low cutoff and uniform control of the projection angle are required. These horns are treated with "Aquaplas", a patented sound deadening material, to assure freedom from resonance and ring. They are designed to operate with an Altec 288C, 290E or 730C Driver Loudspeaker through the proper receiver attachment. Use of an Altec N-500C Network or 15045A 70-volt matching transformer will provide driver protection. Both horns feature a 300-cycle cutoff frequency, and the sound pattern, controlled by the sectoral expansion, is 60-degrees horizontally for the 311-60, and 90-degrees for the 311-90. Vertical distribution for both horns is 40 degrees.

Many experimenters prefer longer, lower cutoff horns over the stock 511/811

- 1.4 inch drivers bolt directly to the large sectoral horns and to various throats of the multicells or CDs

Three types of diaphragms exist for Altec compression drivers:

1. Aluminum: low power handling; best transient and high frequency response (288, 802/902, 804/806)
2. Pascalite: high power handling; transient and high frequency response slightly less than aluminum. (299, 909)
3. Symbiotik: high power handling; poorest transient and high frequency response of the three. (291, 807, 808/908)

There are two basic families of woofers applicable to the A7 — the large magnet 515 series and the less efficient 803/416 variety. There have been many cosmetic and performance changes over the years in both families.

- Early units (515, 803A) use light, stiff cones with 40-45 Hz resonant frequencies and 16 to 20 ohm voice coil impedances
- Later units (515B and later, 803B/416A and later) use heavier cones with 25 Hz resonance and 8 or 16 ohm impedances
- Older units use Alnico magnets; later units use ferrite

DETAILS, DETAILS

Whether you choose small or large format compression drivers, eliminate the throat screens. These screens prevent bugs and other debris from entering the compression

drivers in unattended or hostile commercial environments. Although light and thin, their construction has a polarizing effect on visible light. Remove them from the gaskets on older models; on later units cut an "x" across them with an Exacto knife, then grasp and remove them with a hemostat or large pair of tweezers. These "bug" screens are responsible for the bulk of midrange and treble distortions on program peaks, softening of treble leading edges, midrange colorations, H.F. signal attenuation, and phasey images that are hard to localize. Altec compression drivers sound excellent with these throat restrictions removed.

Whether you choose small or large format compression drivers, use aluminum diaphragms for best home sound. They are available in 8 or 16 ohms impedance for the 1" units; 8, 16, 24, or 32 ohms for the 1.4" types. Their only performance limitation is power handling, but this should be of little concern for Hi-Fi use unless you plan on producing constant, ear-shattering output levels. If you do, use the Pascalites.

Whether you use passive or active crossovers, stay at 500 Hz and employ a relatively long horn with a low cutoff frequency for best performance and sound. The 1" drivers will fit the larger sectorals, multicells, and CDs via throat adapters from Altec. A long horn with a low cutoff will provide more effective throat loading in the crossover region than the stock 511 horn. Consider 311s or 329As. The 329A resembles the 311 pictured above but with reinforcing bars instead of sectors.

Altec 500 Hz crossovers are excellent sounding units. Most are straightforward 12

dB/oct, parallel L/C, Butterworth types that were designed for 8 or 16 ohm loads. A few models (e.g. N500C and E) had their component values set for 12 ohms. Replace the stock wiring and capacitors in these units with your favorites to improve their sound. We measured the stock capacitors in several Altec crossovers and found that some had drifted in value considerably.

Still higher performance can be obtained by bi-amping the A7. I've listened through various solid state and tube crossovers employing 12, 18, and 24 dB/oct slopes and feel they all offer performance advantages over the single amp/crossover per speaker configuration. My favorite is the 24 dB/oct Linkwitz/Riley.

If you like to hear information above 10-12 kHz, opt for the 1" drivers over the 1.4" units. No contest here - tics on 802s sound like pops on 288s; leading edge attacks are razor sharp on 802s, softened on 288s. The 21216 adapter is a current Altec part which will allow the use of 1" drivers on horns designed for 1.4" drivers. Jobber price is around \$75/pr.

The midrange sounds cleaner on drivers that use the machined metal phasing plug. Distortion that is noticeable through a Tangerine plug on steady tones or program material is not present on the metal units.

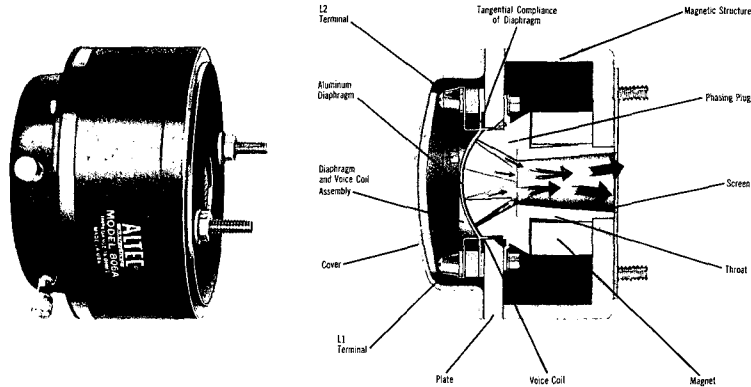
We prefer 416 type woofers in the A7 for the best overall performance in a Hi-Fi application. Use the 515 for low frequency augmentation.

(Continued on page 31)

802D & 806A Driver Loudspeakers

802D
806A

ALTEC 802D
806A



SPECIFICATIONS

	802D	806A
Power:	30 watts (with N-500D or N-800D Network)	30 watts (with N-500D or N-800D Network)
Frequency Response:	500-22,000 cycles	500-22,000 cycles
Pressure Sensitivity:	111.7db* at 1 watt; 126.4db at 30 watts	109.5db* at 1 watt; 124.2db at 30 watts
Impedance:	16 ohms	16 ohms
Voice Coil Diameter:	1.75"	1.75"
Application:	HF Driver unit for wide-range, two-way studio 'Playback' Systems	HF Driver for wide-range, two-way, studio 'Playback' Systems
Protection:	N-500D Network and 511A or 511B horn for 500 cycle crossover N-800D Network and 811B horn for 800 cycle crossover	N-500D Network and 511A or 511B horn for 500 cycle crossover N-800D Network and 811B horn for 800 cycle crossover
Magnet Weight:	1.2 lbs.	13 oz.
Flux:	15,250 Gauss	13,000 Gauss
Dimensions:	Diameter: 4 1/2" Depth: 3 3/4"	Diameter: 4 1/2" Depth: 3 1/4"
Weight:	7 lbs.	5 lbs., 11 oz.
Finish:	Altec Green	Altec Green
Accessories:	511A, 511B, 811B Sectoral Horns; N-500D, N-800D Dividing Networks; 70.7v transformers	511A, 511B, 811B Sectoral Horns; N-500D, N-800D Dividing Networks; 70.7v transformers

* (Ref. .0002 dynes/cm² measured with warble frequency 500 - 2,500 cycles, 4' from mouth of 30" trumpet)
Note: For Multicellular Horns use Altec drivers 730, 288 and 290 types.

PROFESSIONAL 'PLAYBACK' SOUND SYSTEMS BROADCAST & RECORDING STUDIOS • BALL ROOMS AUDITORIUMS • SCHOOL & CHURCH MUSIC ROOMS MUSIC HALLS • THEATRES • NIGHT CLUBS DANCE STUDIOS • WIDE RANGE MUSIC SYSTEMS

The Altec 802D and 806A High Frequency Driver Loudspeakers are designed for all professional PLAYBACK applications requiring outstanding reproduction of sound over an extremely wide frequency range at substantial power levels. Such conditions are readily fulfilled with unusually high efficiency and exceptionally uniform response from 500/800 (dependent on the dividing network and horn employed) to over 22,000 cycles.

When used in conjunction with the Altec 511A, 511B (500 cycle) or 811B (800 cycle) sectoral horn, the N-500D (500 cycle) or N-800D (800 cycle) network, and the 414, 515, or 803 low frequency loudspeaker, the 802D and 806A furnish the realistic reproduction demanded by all major broadcasting stations, recording studios, theatres, auditoriums and music halls.

Both the 802D and 806A transducers utilize a voice coil of notably large diameter (1 3/4") edge wound with aluminum ribbon and coupled to a large 2 1/4" aluminum diaphragm having tangential compliance. A mechanical phasing plug (i.e., pole piece), having two exponential acoustic slots, is utilized to provide the proper phase relationship between the sound emanating from the center and outer edges of the diaphragm and voice coil assembly, thus insuring maximum high frequency reproduction while maintaining a smooth overall response. Either driver is capable of uniform, peak-free reproduction to a point far above the range of human hearing. The entire diaphragm and voice coil assembly of the 802D and 806A is field replaceable; no special tools or skills are required.

For full range systems utilizing low frequency loudspeakers of relatively low efficiency, located in non-reverberant areas having moderate ambient noise levels, the Altec 806A driver proves a perfect match. (Such conditions would be analogous to the average listening room or smaller broadcast and recording studio). In instances wherein relatively high ambience is present, and where maximum efficiency of both vocal speech and music must be reproduced with greatest clarity, the heavier magnet weight and greater flux density of the 802D are preferred. The 802D represents one of the finest high frequency transducers manufactured by Altec; the 2 db greater efficiency (over the 806A), coupled with the same precision accuracy of minute production tolerances, make the 802D the industry standard for laboratory and professional usage alike.

These factors, together with the all-important Altec criterion of engineering experience, combine to produce the 802D and 806A high frequency loudspeakers of virtually matchless quality and limitless application.

Features :

- 500-22,000 Cycle Response
- Smooth, Peak-Free Response
- Extremely High Efficiency
- Low Distortion
- Faithful Reproduction
- Aluminum Diaphragm with Tangential Compliance
- Edge-Wound Voice Coil
- 30-Watt Capacity
- Compact — Easily Installed
- Field Replaceable Diaphragm & Voice Coil Assembly



From 1966 Altec Specifications for Engineers and Architects

ARCHITECTS' & ENGINEERS' SPECIFICATIONS

(FOR ALTEC 802D):

The high frequency driver loudspeaker shall utilize a 2 1/4" diameter aluminum diaphragm having tangential compliance, coupled to a voice coil of edge wound aluminum ribbon having a diameter of 1 3/4". The voice coil gap shall have a flux density of at least 15,250 Gauss, produced by a magnet having a weight of 1.2 pounds. A machined phasing plug, which also serves as the pole piece, having two exponential acoustic slots shall be utilized to provide the proper phase relationship between the sound emanating from the center and edges of the diaphragm and voice coil assembly, thus insuring maximum high frequency reproduction while maintaining a smooth overall response. The entire diaphragm and voice coil assembly shall be field replaceable without requiring special tools or skills; this shall be interpreted to mean that the speaker shall incorporate self-centering dowels to insure proper spacing and alignment of the diaphragm and voice coil assembly.

The HF driver loudspeaker shall produce a sound pressure level of at least 111.7 db with 1 watt input and 126.4 db with 30 watts input at a distance of 4 feet from the mouth of a 30" trumpet when a warble band of 500 to 2,500 cycles is used. Single frequency measurements shall not be acceptable under this specification. The frequency response of the HF driver shall be uniform over the range of (SPECIFY):

500 to 22,000 cycles, when used with the Altec 511A or 511B sectoral horn and N-500D dividing network, 800 to 22,000 cycles, when used with the Altec 811B sectoral horn and N-800D dividing network.

Any high frequency driver loudspeaker not meeting all of the foregoing requirements shall not be acceptable under this specification.

The high frequency driver loudspeaker shall be Altec Lansing Model 802D.

(FOR ALTEC 806A):

The high frequency driver loudspeaker shall utilize a 2 1/4" diameter aluminum diaphragm having tangential compliance, coupled to a voice coil of edge wound aluminum ribbon having a diameter of 1 3/4". The voice coil gap shall have a flux density of at least 13,000 Gauss, produced by a magnet having a weight of 13 ounces. A machined phasing plug, which also serves as the pole piece, having two exponential acoustic slots, shall be utilized to provide the proper phase relationship between the sound emanating from the center and edges of the diaphragm and voice coil assembly, thus insuring maximum high frequency reproduction while maintaining a smooth overall response. The entire diaphragm and voice coil assembly shall be field replaceable without requiring special tools or skills; this shall be interpreted to mean that the speaker shall incorporate self-centering dowels to insure proper spacing and alignment of the diaphragm and voice coil assembly.

The HF driver loudspeaker shall produce a sound pressure level of at least 109.5 db with 1 watt input and 124.2 db with 30 watts input at a distance of 4 feet from the mouth of a 30" trumpet when a warble band of 500 to 2,500 cycles is used. Single frequency measurements shall not be acceptable under this specification. The frequency response of the HF driver shall be uniform over the range of (SPECIFY):

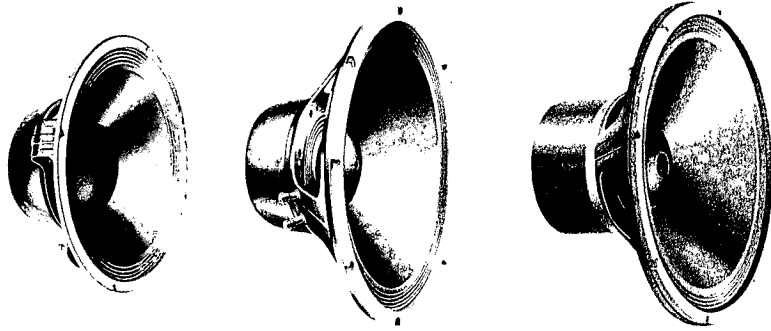
500 to 22,000 cycles with the Altec 511A, 511B sectoral horn and N-500D dividing network, 800 to 22,000 cycles with the Altec 811B sectoral horn and N-800D dividing network.

Any high frequency driver loudspeaker not meeting all of the foregoing requirements shall not be acceptable under this specification.

The high frequency driver loudspeaker shall be Altec Lansing Model 806A.

414A, 416A, 515B L. F. Loudspeakers

414A
416A
515B



414A

416A

515B

Features

- Heavy Alnico V magnet
- Edge-wound voice coil
- Rugged construction
- Smooth response
- High efficiency
- Low cone resonance
- Low distortion
- High power capacity
- High linearity

LOW FREQUENCY SPEAKERS FOR WIDE-RANGE, TWO-WAY SOUND REINFORCEMENT SYSTEMS • OUTSTANDING AUDIO REPRODUCTION FOR THE LARGEST CONCERT HALL, THEATRE, AND AUDITORIUM SYSTEMS • PROFESSIONAL 'PLAYBACK' SYSTEMS • BROADCAST AND RECORDING STUDIO MONITORING

Altec low frequency loudspeakers are designed for use in the finest recording and broadcast studio 'Playback' systems as well as providing outstanding reproduction of the lower audio spectrum when used in two-way systems for the largest theatres and auditoriums. Utilizing heavy Alnico V permanent magnets, rugged, die-cast frames, edge-wound copper ribbon voice coils of the largest practical diameter, and exceptionally compliant cone suspension, these LF transducers combine the advantages of long-term operation with unparalleled response throughout the entire audible bass frequency range.

The smooth response and exceptional linearity of each loudspeaker is achieved by means of strict adherence to precision design and manufacturing tolerances. The axial retention of the voice coil, in a magnetic field uniform over the full excursion, assures the clarity of bass reproduction at high power levels. The low cone resonance, when coupled to a properly designed Altec enclosure, eliminates virtually all 'doubling' or self-generation of unwanted harmonic components.

The Altec 414A, with a range exceeding 30 to 4,000 cycles, is an outstanding 12-inch LF transducer—ideal for use in institutional and entertainment systems of moderate size and coverage area. The power rating of 25 watts makes the 414A, singly or in multiples, an excellent choice in two-way systems utilizing Altec high frequency drivers and sectoral horns.

The Altec 416A is a 15-inch low frequency loudspeaker of professional quality, chosen to complement the finest broadcast and recording studio monitor systems (such as the Altec A7 and A7-500) in addition to providing the critical listener with superb bass reproduction for all wide-range public address, sound reinforcement and theatre or auditorium systems.

The Altec 515B, with its exceptional low frequency response, high efficiency and ability to faithfully reproduce the lowest audio frequencies at unusually high power levels remains the unchallenged leader in the largest and finest two-way systems throughout the world. When used in conjunction with the Altec 288C HF driver, N-500C dividing network and multicellular horn of the desired size and coverage angle, the 515B becomes an integral part of the identical Altec 'Voice of the Theatre' loudspeaker systems currently employed by the majority of the largest and finest theatres, auditoriums and concert areas.

ALTEC 414A, 416A, 515B

SPECIFICATIONS

	414A	416A	515B
Power Rating (Continuous):	25 watts	30 watts	35 watts (50 watts peak)
Frequency Response:	30-4,000 cycles	20-1,600 cycles	20-1,000 cycles
Pressure Sensitivity:	99 db (SPL at 4' from 1 watt*)	99 db (SPL at 4' from 1 watt*)	103 db (SPL at 4' from 1 watt*)
	113 db (SPL at 4' from full 25 watts)	114 db (SPL at 4' from full 30 watts)	118.5 db (SPL at 4' from full 35 watts)
Impedance:	16 ohms	16 ohms	16 ohms
Cone Resonance:	30 cycles	25 cycles	25 cycles
Voice Coil Diameter:	3"	3"	3"
Magnetic Assembly:			
Magnet Weight:	1.8 lbs.	2.4 lbs.	4.4 lbs.
Magnet Type:	Alnico V	Alnico V	Alnico V
Flux Density:	10,000 Gauss	12,000 Gauss	14,750 Gauss
Construction:			
Frame (Basket):	Structurally-reinforced cast aluminum	Structurally-reinforced cast aluminum	Structurally-reinforced cast aluminum
Cone:	Molded Fibre	Molded Fibre	Molded Fibre
Cone Suspension:	High-compliance cloth surround with mechanical resistance	High-compliance cloth surround with mechanical resistance	High-compliance cloth surround with mechanical resistance
Voice Coil:	Edge-wound copper ribbon	Edge-wound copper ribbon	Edge-wound copper ribbon
Diameter:	12 1/4"	15 3/4"	15 3/4"
Weight:	15 lbs.	17 1/2 lbs.	26 lbs.
Mounting:			
Mounting Hole Diameter:	10 1/4"	13 1/4"	13 1/4"
Mounting Bolt Centers:	4 holes, equally spaced, on 11 3/4" centers	4 holes, equally spaced, on 14 1/4" centers	4 holes, equally spaced, on 14 1/4" centers
Loudspeaker Depth:	5 5/8"	7"	7 3/4"

The Altec 414A, 416A, and 515B low frequency speakers may be used to greatest advantage in wide range, two-way systems with the addition of the following Altec components:

HF Drivers & Horns: 802D & 806A (with 511A/B or 811B Sectoral Horns)
288C & 290D (with Altec multicellular horn having proper cutoff frequency and distribution pattern)

Accessories:

Altec Loudspeaker Enclosures: For 414A: 612B, 614B, 618B, 622B, 855A, 858A, 859A.
For 416A & 515B: 612B, 614B, 825A, 855A, 856A, 857A, 858A, 859A, 210, 410.

be used to greatest advantage in wide range, two-way

Dividing Networks: N-800D (800 cycle crossover)
N-500C (500 cycle crossover)
N-500D (500 cycle crossover; for use with Altec 802D & 806A HF Drivers)
*414A = EIA rating of 52db at 30 ft. from 1 milliwatt
416A = EIA rating of 52db at 30 ft. from 1 milliwatt
515B = EIA rating of 56db at 30 ft. from 1 milliwatt

ARCHITECTS AND ENGINEERS SPECIFICATIONS

414A

The low-frequency speaker shall be 12" in diameter and shall have a minimum pressure sensitivity of 99 db (spl at 4 ft. from 1 watt) measured on axis. The voice coil shall be approximately 3" in diameter and shall be of edge-wound copper ribbon operating in a magnetic field of at least 10,000 gauss derived from an Alnico V magnet weighing 1.8 pounds minimum. Speakers with smaller voice coils or round wire windings are not acceptable under this specification. The free-air resonance of the speaker shall not be greater than 30 cycles and it shall have a continuous power rating of at least 25 watts. Frequency response of the speaker shall range from 30 to 4,000 cycles. Any low-frequency speaker not meeting all of these requirements shall be deemed unacceptable under this specification. The speaker shall be Altec Lansing Model 414A.

416A

The low-frequency speaker shall be 15" in diameter and shall have a minimum pressure sensitivity of 99 db (spl at 4 ft. from 1 watt) measured on axis. The voice coil shall be approximately 3" in diameter and shall be of edge-wound copper ribbon operating in a magnetic field of at least 12,000 gauss derived from an Alnico V magnet weighing 2.4 pounds minimum. Speakers with smaller voice coils or round wire windings are not acceptable under this specification. The free-air resonance of the speaker shall not be greater than 25 cycles. The speaker shall have a continuous power rating of at least 30 watts and shall have a frequency response from 20 to 1,600 cycles. Any low frequency speaker not meeting all of these requirements shall be deemed unacceptable under this specification. The speaker shall be Altec Lansing Model 416A.

515B

The low-frequency speaker shall be 15" in diameter and shall have a minimum pressure sensitivity of 103 db (spl at 4 ft. from 1 watt) measured on axis. The voice coil shall be at least 3" in diameter, of edge-wound copper ribbon, operating in a magnetic field of at least 14,750 gauss derived from an Alnico V magnet weighing 4.4 pounds minimum. Speakers with smaller voice coils or round wire windings are not acceptable under this specification. The free-air resonance of the speaker shall not exceed 25 cycles. The speaker shall have a continuous power rating of at least 35 watts and a peak power rating of at least 50 watts. Frequency response shall be uniform from 20 to 1000 cycles. Any low-frequency speaker not meeting all of these requirements shall be deemed unacceptable under this specification. The speaker shall be Altec Lansing Model 515B.



WHO STOLE THE DEEP BASS?

Nobody. The stock A7 cabinet cannot efficiently produce deep bass due to the relatively high box resonance created by its low port area to internal volume ratio. If you increase the ratio (hopefully by decreasing the port area - not enlarging the box!) the rise in electrical impedance will degrade the bass smoothness, efficiency, and transient response that the A7 is famous for. The solution to this dilemma is to find a subwoofer that can be blended seamlessly with the A7 "sound". We couldn't find any.

We became interested in adapting the Karlson Enclosure to this task after Bill Fisher related an anecdote about the ability of this mid-50s design to produce significant low frequency output from a relatively small volume. The story went something like this: A mysterious source of energy was shaking things off the wall in the juke box repair shop. It was eventually traced to infrasonic turntable rumble being reproduced by the shop's Karlson test speaker!

The Karlson is a folded pipe configuration that drives its bass output through a tapered, exponential slot with both front cone radiation and a chamber driven reflex port. A pair of K-15s were soon acquired for experimentation. While John applied his professional level of carpentry skills to the modifying and refinishing tasks, I busied myself with tuning, impedance and response testing, and bandpass filter design.

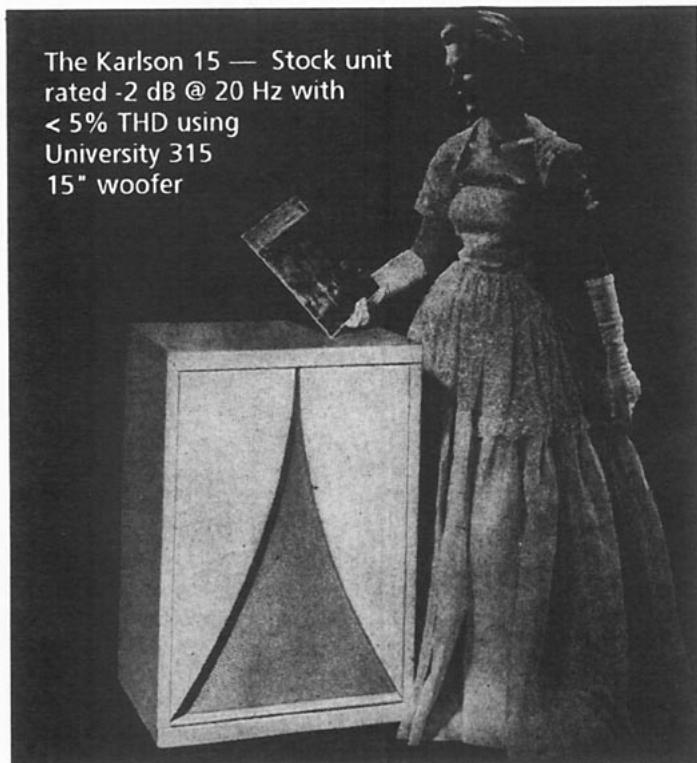


Photo from 1956 advertisement

Specific modifications applied to the Karlson Enclosure for 15" drivers included:

- Altec 416 or 515 woofer with 25 Hz resonant cone installed
- Stock reflex port replaced with two 3", 90 (degree) PVC elbows.
- Enclosure tuned to 30 Hz
- Active bandpass filter implemented; centered at 30 Hz with -3 dB points at 19 and 45 Hz; 12 dB/oct skirts. (Requires 12 to 15 dB of boost above line level at 30 Hz for good subjective blending with A7s)
- Carpet piercing spikes attached to cabinet

The Karlson adaptation adds seamless balance to A7 based systems when reproducing music and movie soundtracks containing deep bass. The Karlson, like the A7, is easy to drive — a Mac 40 works well.

FINAL MIX

The performance that results from carefully optimizing the small Altec VOT speaker for Hi-Fi can be truly stunning. The remedies that we have suggested here can be applied to the thousands produced since 1947, including the current production A7-8G system. If you don't think a speaker can have explosive dynamics, wall-to-wall imaging, a seamless midrange that just won't quit, incredibly low distortion, a sweet, airy, top end, and do all this *without a hint of strain*, you haven't driven a good horn system lately!

Footnotes:

- ¹ Ted Uzzle, "Polarity and Phase", Application Note AN-9, Altec Lansing Corp., 1986.

RESOURCES

Factory reconing service is available for most Altec woofers. Your local reconing service might be competent to replace cones but Altec has equipment to remagnetize drivers, a procedure often required after 15 or 20 years of service to restore full performance. Contact Altec Service Dept. for more information.

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