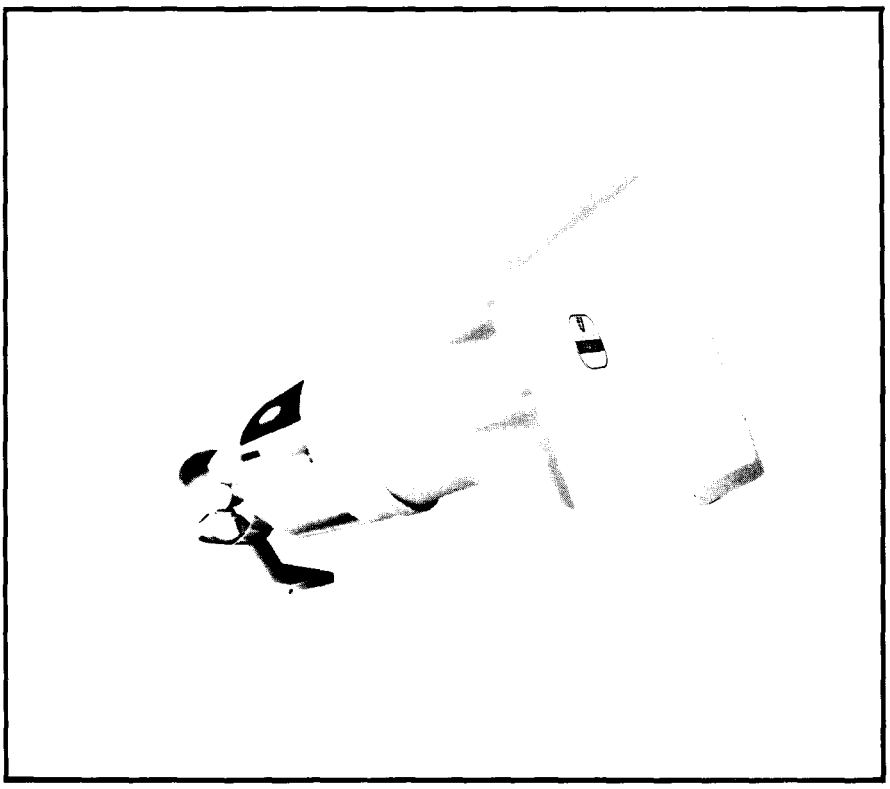
University Sound™

a MARK IV company

SPECIFICATIONS

Frequency Response:
400-6,500 Hz ± 5dB
(see Figure 1)
Power Handling:
8 hours, 6-dB crest factor:
15 watts (500-5,000 Hz pink noise)
Impedance:
See Table II
Sound Pressure Level at 1 Meter, 1 Watt Input Averaged, Pink Noise Band-Limited from 500 to 5,000 Hz:
107 dB
Horizontal Beamwidth:
60° (+20°, –20°)
(–6 dB, 1.0 kHz to 10 kHz)
Vertical Beamwidth:
40° (+20°, –10°)
(–6 dB, 2.0 kHz to 10 kHz)
Directivity Factor R_θ (Q):
15.2 @ 2 kHz
Usable Low-Frequency Limit:
350 Hz (see Table 1)
Construction:
High-impact acrylic-styrene-acrylonitrile (ASA) with ultraviolet light inhibiting mesa tan finish; positive-lock, super tough nylon swivel base and rear housing
Voice-Coil Diameter:
3.81 cm (1.5 in.)
Magnet Weight:
0.28 kg (0.63 lb)
Magnet Material:
Strontium ferrite
Flux Density:
1.30 Tesla
Dimensions,
Height:
22.6 cm (8.9 in.)
Width:
30.7 cm (12.1 in.)
Depth:
35.8 cm (14.1 in.)
Net Weight:
1.7 kg (3.8 lb)
Shipping Weight:
2.1 kg (4.6 lb)



PA415T Constant-Directivity Paging Projector

DESCRIPTION

The University Sound PA415T is a conservatively rated 15-watt constant-directivity paging projector for use in any public address or paging application.

The driver employs a rugged phenolic diaphragm, 1.5-inch diameter voice coil and a "rim centered" ferrite magnet structure for long life and reliability under extreme operating conditions.

A 12-inch connecting cable, color coded for phase, is provided for connecting to the PA415T.

Included are connections for 25-V, 70-V and 100-V distributed systems, and a screwdriver-operated power tap select switch. (Patent #4,775,766)

A nominal 60° horizontal by 40° vertical coverage pattern together with a low-frequency cutoff of 350 Hz provides excellent articulation in demanding applications.

The PA415T is molded from high-impact ultraviolet-inhibiting acrylic-styrene-acrylonitrile (ASA). A positive-lock, super tough nylon swivel base and rear housing provides maximum mounting flexibility and ease of installation (Patent #4,984,238).

Ideal for both indoor and outdoor applications, the PA415T paging projector is well suited for any installation requiring rugged, reliable performance.

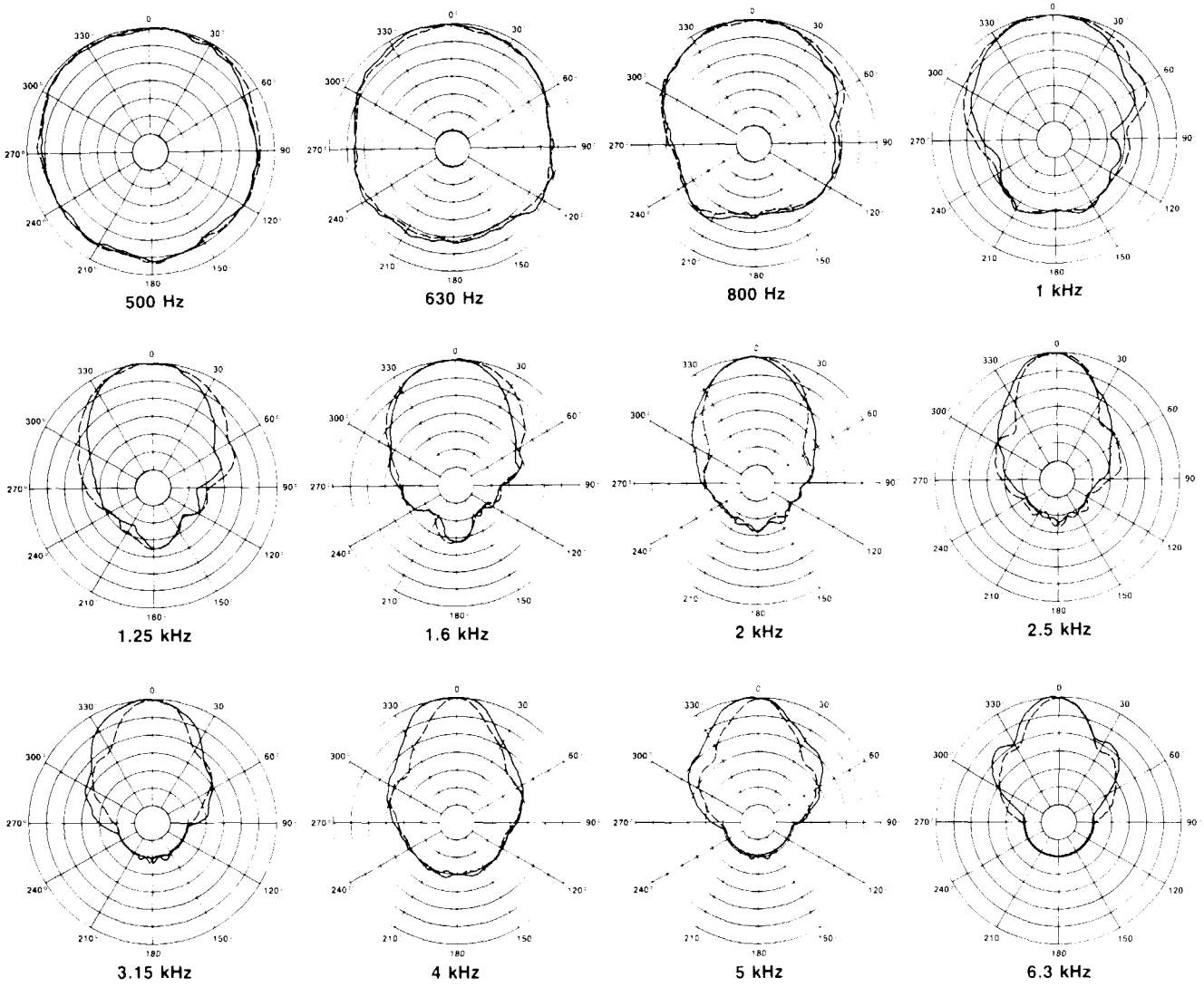


FIGURE 1
PA415T Polar Response

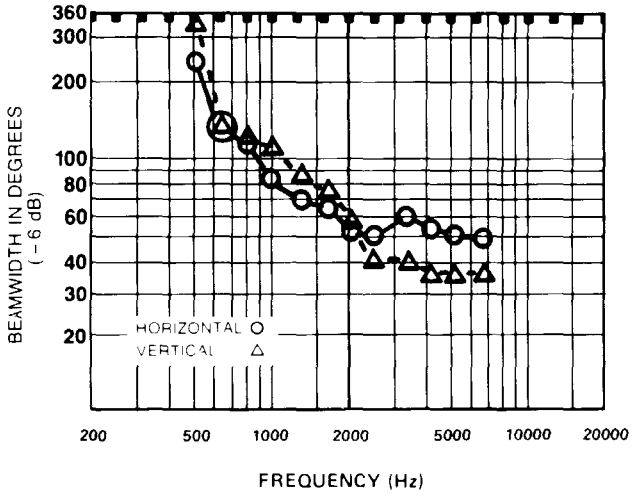


FIGURE 2
PA415T Beamwidth vs. Frequency

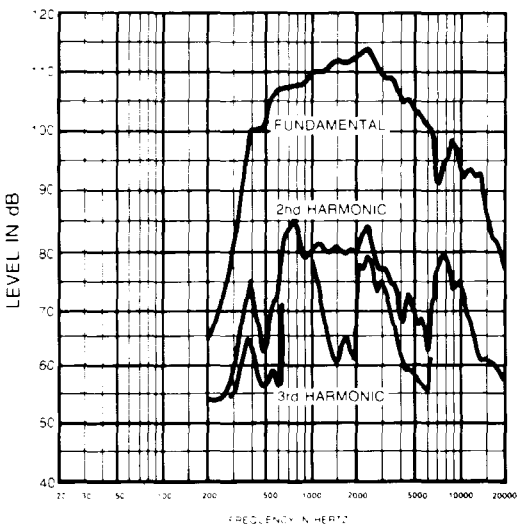


FIGURE 3
PA415T Frequency Response
(1 watt at 1 meter)

POLAR RESPONSE

The directional characteristics of the PA415T were measured by running a set of horizontal/vertical polar responses in University's large anechoic chamber, at each one-third-octave center frequency. The test signal was one-third-octave pseudo-random pink noise centered at the indicated frequencies. The measurement microphone was placed 6.1 m (20 ft.) from the horn mouth, while rotation was about the wave-guide geometric apexes. These axes of rotation are quite close to apparent (acoustic) apexes across the frequency range of measurement. Errors attributable to the slight differences between the geometric and acoustic apexes are reduced to an inconsequential level by the relatively long, 20-foot measuring distance. The horn was suspended freely with no baffle. The polar plots shown in Figure 1 display the results of these tests. The center frequency is noted on each plot. The wider plot on each chart is the horizontal polar (-) and the narrower plot is the vertical polar (- - -).

BEAMWIDTH

A plot of the PA415T's 6-dB-down total including beamwidth angle is shown in Figure 2 for each one-third-octave center frequency.

FREQUENCY RESPONSE

Figure 3 shows the axial frequency response of the PA415T. It was measured at a distance of 1 meter, using a swept sine wave.

INSTALLATION

The PA415T has been designed to accommodate a wide range of mounting and aiming requirements.

Mounting to wall, ceiling or to electrical boxes is accomplished without the common requirement of adding a steel plate to the base. Bonding straps may be used for mounting to beams. All mounting holes are knocked through only as needed, preserving a seal in the remaining knockout areas.

Wiring is enclosed within the product base, providing physical protection of wiring and personnel.

The mounting assembly provides three degrees of freedom, allowing the horn to be oriented for any coverage pattern desired. Adjustment is accomplished with hand-tightenable nuts which require minimal torque to maintain horn position.

During installation, after punching out the desired attachments, the base and horn are loosely secured with one screw. This leaves hands free to wire the PA415T zip cord and feed wiring together. After tucking wire connections into the electrical box or base, install remaining screws.

TRANSFORMER CONNECTION

A transformer and power selector switch are installed in the rear housing.

The level of the PA415T may be adjusted by moving the switch setting (see Table II) using a coin or screwdriver. Clockwise increases the power. Since the same switch and transformer are used for either the 100-volt, 70-volt or 25-volt line, the power setting depends upon the amplifier output that is used, 100-volt, 70-volt or 25-volt.

25-Volt Line	70-Volt Line	100-Volt Line
50 V	150 V	150 V
50 *mf*	5 *mf*	2.5 *mf*

TABLE 1 — Recommended Series Protection Capacitor

POWER	IMPEDANCE		
	100-Volt	70-Volt	25-Volt
15 W	670Ω	335Ω	42Ω
7.5 W	1,360Ω	670Ω	84Ω
3.7 W	2,700Ω	1,360Ω	170Ω
1.9 W	5,400Ω	2,700Ω	340Ω
0.9 W	10,800Ω	5,400Ω	680Ω

TABLE II — Power Taps

CAUTION: When connected to a 100-volt, 70-volt or 25-volt line, do not use the switch settings marked DO NOT USE, as this may result in excessive power driving the PA415T.

LOW-FREQUENCY DRIVER PROTECTION

For proper system operation, program information should be highpassed at 300 Hz or higher with at least a 6 dB/octave slope filter. This is best accomplished before the power amplifier using a low-level crossover; however, protection of amplifier and paging projector may alternately be accomplished using a capacitor in series with the projector. Table 1 gives values for this protection capacitor. Polyester capacitors are recommended, but non-polarized electrolytic or two series, back-to-back connected electrolytics, each of twice the value shown, may be used.

ARCHITECTS' AND ENGINEERS' SPECIFICATIONS

The loudspeaker shall be an integral driver and constant-directivity horn utilizing a rugged phenolic diaphragm and high-temperature-rated, 1.5-inch diameter voice coil.

The axial frequency response will extend from 400 to 6,500 Hz and the horn shall exhibit a low-frequency cutoff of 350 Hz. Sound pressure level will be 107 dB (1 W/1 m) with a 500-to-5,000-Hz pink-noise signal applied, and the horn will produce a horizontal beamwidth of 60° and a vertical beamwidth of 40° from 2 kHz to 10 kHz.

The loudspeaker shall be capable of handling a 15-watt, 500-to-5,000 Hz pink-noise signal with a 6-dB crest factor for a period of 8 hours.

The horn shall be molded high impact acrylic-styrene-acrylonitrile (ASA), capable of satisfactory mechanical performance in the temperature range from –40° C (–40° F) to 71° C (160° F) and not subject to sunlight embrittlement. Other major external speaker parts shall be molded nylon finished in a mesa tan to match the horn. All components shall be resistant to damage from weather, moisture, and fungus.

A positive-lock swivel bracket shall provide orientation adjustment in all three planes. Vertical adjustments are made by loosening one or both of the locking nuts on the mounting hoop.

Dimensions shall be 22.6 cm (8.9 in.) high by 30.7 cm (12.1 in.) wide and 35.8 cm (14.1 in.) deep.

The loudspeaker shall be the University Sound PA415T, which includes a 100-V/70-V/25-V line-matching transformer and weighs no more than 1.7 kg (3.8 lb).

WARRANTY (Limited) — University Sound Speakers and Speaker Systems (excluding active electronics) are guaranteed for five years from date of original purchase against malfunction due to defects in workmanship and materials. If such malfunction occurs, unit will be repaired or replaced (at our option) without charge for materials or labor if delivered prepaid to University Sound. Unit will be returned prepaid. Warranty does not extend to finish, appearance items, burned coils, or malfunction due to abuse or operation under other than specified conditions, including cone and/or coil damage resulting from improperly designed enclosures, nor does it extend to incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you. Repair by other than University Sound will void this guarantee. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

For warranty repair and service information on University Sound products, contact: University Sound, Inc., 13278 Ralston Avenue, Sylmar, CA 91342-7607; Phone: 818-362-9516; FAX: 818-362-3463; Attention: Customer Service Department.

For technical assistance, contact the Technical Services Representative at University Sound, Inc.

Repair locations:
Speaker products including LR Line radiators, PI Series speakers, CDP848AT, CDP850T, Musicastor100, FC100, Interface® Series, MC Series, SP Series, and TK60: University Sound, Inc., 600 Cecil Street, Buchanan, MI 49107; Attention: Service Department.

For Rocky Mountain and Western U.S.: University Sound, Inc., 8234 Doe Avenue, Visalia, CA 91391; Attention: Service Department.

All other paging speakers and speaker products: University Sound, Inc., 10500 West Reno, Oklahoma City, OK 73125; Attention: Service Department.

Specifications subject to change without notice.

BASIC GUIDELINES FOR THE USE OF HORNS AND DRIVERS WITHIN A SOUND SYSTEM

SIGNING FOR INTELLIGIBILITY AND ADEQUATE SPL

Basic Idea

ıy sound systems would have better performance if the following basic ıciples are kept in mind. Speakers with the appropriate coverage ːerns should be chosen, aimed and powered to achieve uniform direct ɪ in the highly absorptive audience, with no sound aimed at the ɛctive wall and ceiling surfaces. Where multiple speakers are required ırder to achieve a uniform direct field, their coverage patterns should only slightly overlapped, so that each section of the audience is ⁄ered by a single speaker. To the extent this ideal is achieved, erberation is minimized and intelligibility is maximized.

ɛ following material explains these concepts in more detail and illus-tes two design approaches.

ıat is Reverberation?

ːverberation is the persistence of sound within an enclosure, such as a ɔm, after the original sound has ceased. Reverberation may also be ınsidered as a series of multiple echoes so closely placed in time that ɛy merge into a single continuous sound. These echoes decrease in ⁄el with successive reflections, and eventually are completely absorbed ⁄ the room.

ɔn-Reverberant Environments

ɲ open, outdoor space is considered to be a non-reverberant environ-ent, as virtually all sound escapes the area without reflection.

ariations in Level Due to Distance for Non-Reverberant Environments

ı non-reverberant environments, such as outdoors, sound pressure level ːill be reduced by half (6 dB) every time the distance from the speaker is oubled (this is called the inverse-square law). Figure A shows the dB ɔsses to be expected as distance from the speaker is increased from the ne-meter (3.28-foot) measuring distance typically used in SPL specifica-ons.

ieverberant Environments

Vhere sound is reflected from walls and other surfaces, there is a point ıeyond which the "reverberant field" dominates and the sound pressure ɛvel is higher and more constant than predicted by using the inverse-quare law alone.

ariations in Level Due to Distance for Reverberant Environments

he reverberant field will begin to dominate typically at distances of 10 to 0 feet. This distance is greatest for the least reverberant rooms and peakers with narrow beam-width angles. The frequency and beamwidth pecifications provided by the data sheet are still required to obtain atisfactory distribution of the direct sound (or direct field) from the ɔudspeaker(s), which still follows the inverse-square law. It is the direct ignal that contributes to speech intelligibility. This is why the sound ystem designer should seek a uniform direct field, with as little reverber-nt field as possible. For example, consider a single speaker with a wide ıeamwidth angle used to cover a long, narrow, reverberant room. The lirect field will be so far below the reverberant field at the back of the room ıat speech will probably be unintelligible.

alculating Variations in Level Due to Changes in Electrical Power

ach time the power to the speaker is reduced by one-half, a level drop f 3 dB occurs. The nomograph of Figure B shows the change in dB to be xpected as the power varies from the one-watt input typically used in SPL pecifications.

ower Handling

he power rating of a speaker must be known to determine whether a lesign is capable of meeting the sound pressure level requirements of the ystem. The power rating combined with the sensitivity will enable a ystem designer to calculate the maximum sound pressure level attain-ble at a given distance.

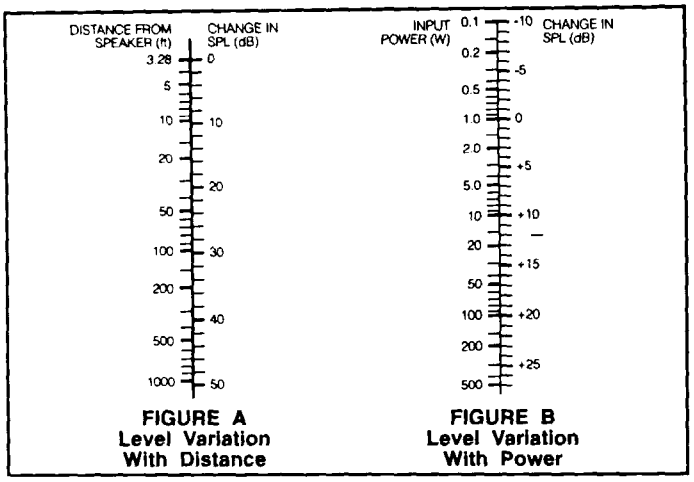


FIGURE A
Level Variation With Distance

FIGURE B
Level Variation With Power

Powering to Achieve Both Average and Peak SPL

The average power that must be delivered to the speaker(s) to achieve the desired average SPL can be determined from the previously presented material on speaker sensitivity, level variation with distance and level variation with power. Enough additional power must be available to reproduce without distortion the short-term peaks and average capability of a sound system, when expressed in dB, is often called "peak-to-average ratio," "crest factor" or "headroom." The peaks can be large, as noted earlier: at least 10 times the average (10 dB).

The better sound systems are designed for peaks that are 10 dB above the average, although 6 dB of headroom is sufficient for most general-purpose voice paging systems. The 10-dB peaks require amplifier power ten times that required for the average sound levels. The 6-dB peaks require four times the power.

Utilizing Speaker Beamwidths Information for Maximum Intelligibility

Knowing the beamwidth angle of a loudspeaker can aid in providing a uniform direct field in the listening area. After selecting a desired speaker location, the beamwidth angle needed to adequately cover the listeners without spilling over to the walls or ceilings must be determined. Once these angles are known, the correct speaker can be found by using catalog specifications.

Using Easy-VAMP™ and Floor-Plan Isobars

In some circumstances, it is desirable to use an approach that is more detailed than using the basic horizontal and vertical beamwidth angles. Environments which have excessive reverberation or high ambient noise levels make it especially difficult to achieve the desired SPL and intelligi-bility.

In recent years, a number of computer-based techniques have been developed to help sound system designers. Some of the more complex systems use personal computers, with relatively sophisticated graphics. Simpler systems, such as Electro-Voice's VAMP™ (Very Accurate Map-ping Program), utilize clear overlays and require programmable scientific calculators. However, the hardware/software and training investment required to utilize even the simpler systems are not attractive to some sound systems designers. Because of this, University Sound has devel-oped a special adaption of VAMP, called Easy-VAMP™, which provides a similar design aid without the complexity and cost of the VAMP programs.

More information on both the Easy-VAMP™ and floor-plan isobars can be found in the University Sound System Installation Guide, available by calling University Sound customer service at 1-800-444-9516.

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