™University Sound.

a MARK IV company

SPECIFICATIONS

Horizontal Beamwidth:
74° @ 2 kHz (see Figure 2)

Vertical Beamwidth:
74° @ 2 kHz (see Figure 2)

Directivity Factor R_θ (Q):
7.0 @ 2 kHz (see Figure 3)

Usable Low-Frequency Limit:
400 Hz

Construction:
Horn reflectors of high-impct Butyrate, bells of spun aluminum, and tone arms of diecast aluminum. Finished in gun metal gray baked acrylic.

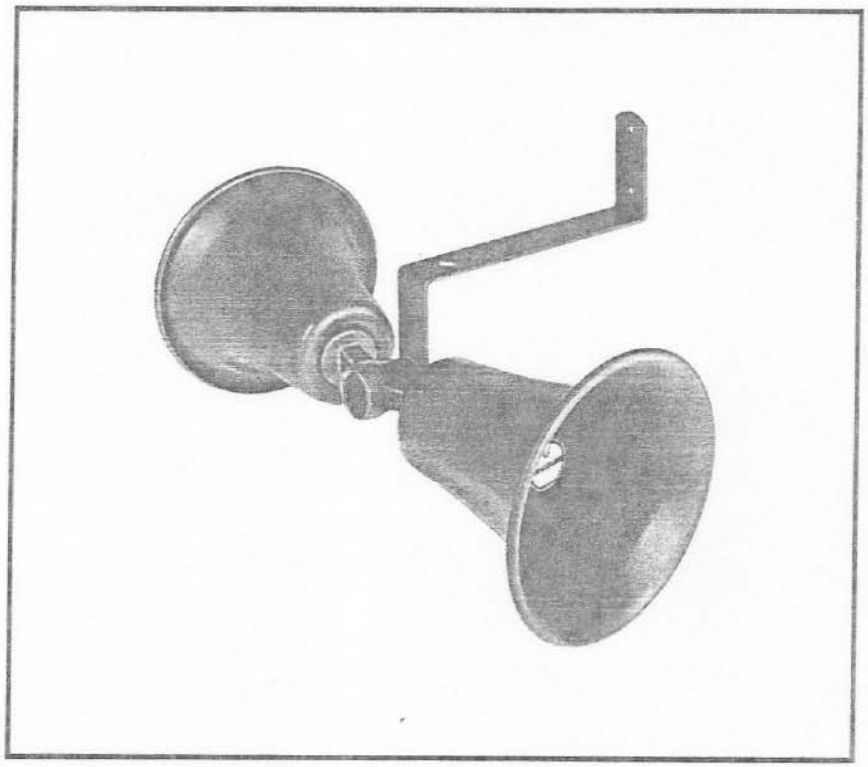
Mechanical Connection of Driver:
Threaded metal throat insert to accommodate a screw-in driver with a throat opening of 0.7-inch to 1.0-inch diameter and a standard 1⅜-inch thread.

Dimensions,
Diameter, Each Horn:
21.6 cm (8.5 in.)
Length:
52.0 cm (20.5 in.)

Net Weight:
1.2 kg (2.5 lb)

Shipping Weight:
2.0 kg (4.5 lb)

Recommended Drivers:
ID30C8
ID30C16
ID30CT
ID60C8
ID60C16
ID60CT
ID75
7110XC
1824S
1828
1828T
1829



2WP Two-Way Horn

DESCRIPTION

The University Sound 2WP is a bi-directional reentrant design providing economical and practical means of covering two oppositely located areas effectively and efficiently.

A single driver serves both reflexed horns through a special "T" acoustic coupler. Any University Sound driver can be used.

A unique mounting bracket arrangement lets the sound be projected 10° outward or 10° downward.

The 2WP is recommended for use such as paging and "talk-back" in narrow corridors, or larger areas of stations, terminals, and warehouses.

The 2WP is dependable for perfect clarity indoors or out, under any extreme conditions.

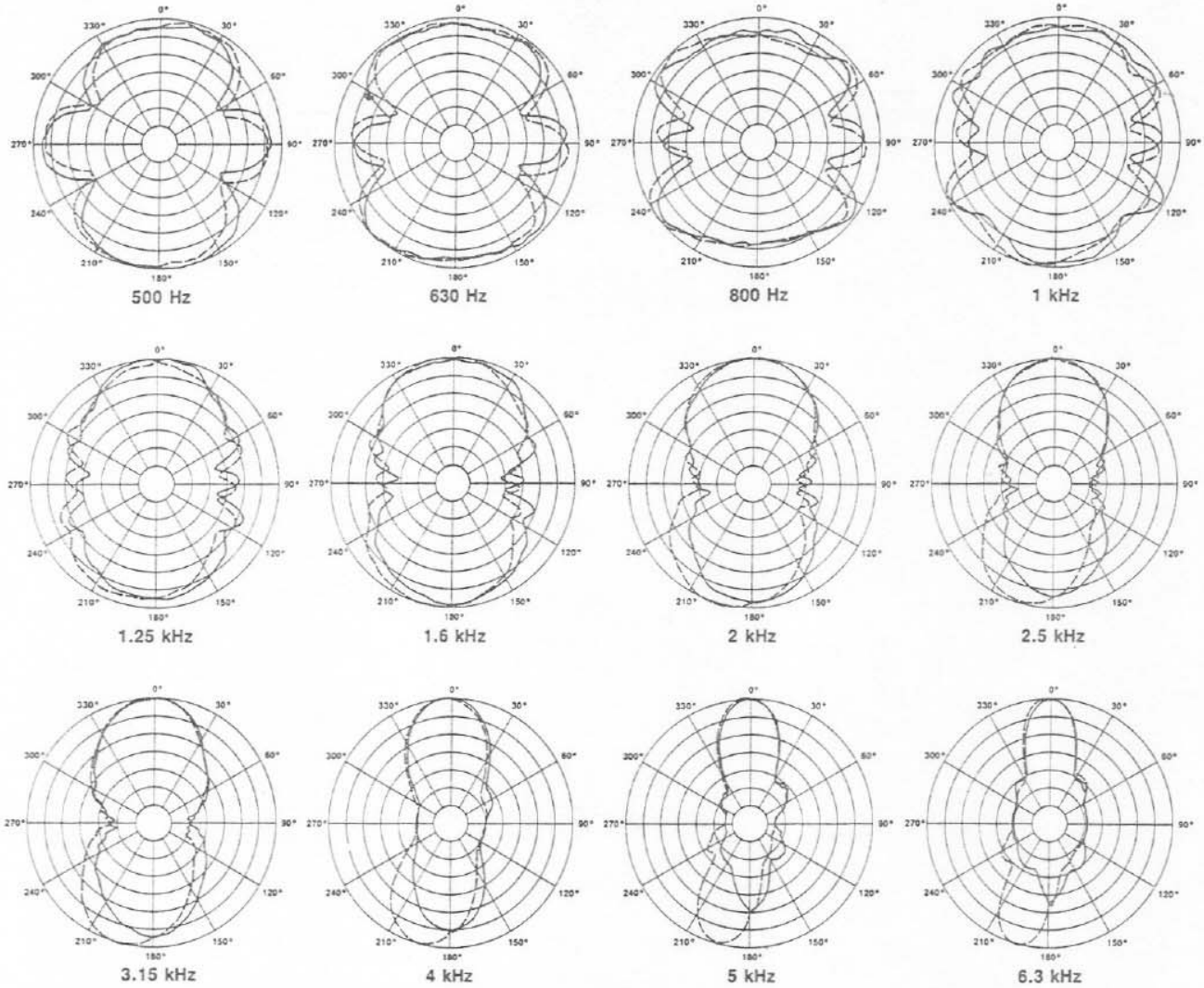


FIGURE 1
2WP Polar Response

HORIZONTAL ———
VERTICAL - - - -

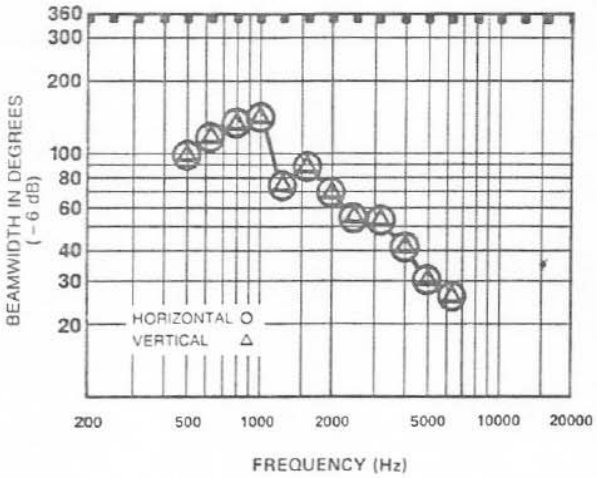


FIGURE 2
2WP Beamwidth vs. Frequency

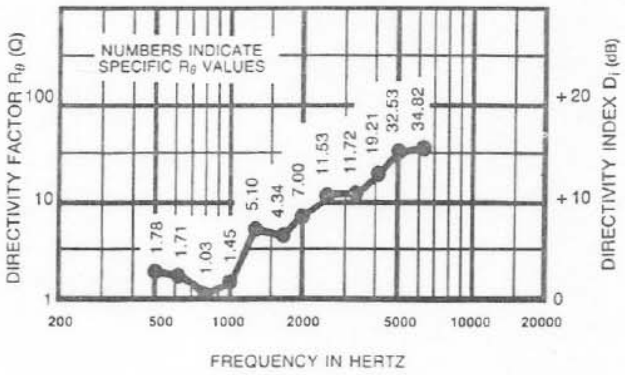


FIGURE 3
2WP Directivity Factor and Directivity Index vs. Frequency

centered at the indicated frequencies. The measurement microphone was placed 6.1 m (20 ft.) from the horn mouth, while rotation was about the waveguide geometric apexes. These axes of rotation are quite close to the 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 polar plots shown in Figure 1 display the results of these tests. The center frequency is noted on each plot.

BEAMWIDTH

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

DIRECTIVITY FACTOR

Figure 3 shows the directivity factor of the 2WP. It was measured at a distance of 1 meter, using a swept sine wave.

INSTALLATION

To assemble the projector, place one trumpet bell on one end of the mixing chamber, through entrance (⅞-inch diameter hole) of bell, and then screw one center assembly clockwise into threaded end of mixing chamber. (NOTE: center assembly is furnished with a fibre gasket cemented to base.) Repeat above procedure to assemble other half of projector. To mount driver unit, screw driver clockwise into mixing chamber tightly (see Figures 4 through 7 for four common mounting applications for Model 2WP).

ARCHITECTS' AND ENGINEERS' SPECIFICATIONS

The horns shall form a joined bi-directional paging projector being able to cover two oppositely located areas as a unit.

The projector shall have two doubly reflexed horns with reflectors of high-impact Butyrate, bells of spun aluminum, and tone arms of diecast aluminum. The horns shall face in opposite directions and be joined by a cast aluminum "T" acoustic coupler.

It shall be possible to use a driver unit up to five inches in diameter having 1⅜-inch-18 thread screwed directly into the acoustic coupler.

Each bell mouth diameter shall not exceed 21.6 cm (8.5 in.), and will have dispersion angle of 74° at 2 kHz.
Low-frequency cutoff shall be 400 Hz.

baked acrylic. The University Model 2WP is specified.

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.

Service and repair information for this product: University Sound, Inc., Phone 818/362-9516, FAX 818/367-5292.

Applications and technical information for University Sound products: University Sound, Inc., Technical Coordinator, Phone 818/362-9516, FAX 818/367-5292.

Specifications subject to change without notice.

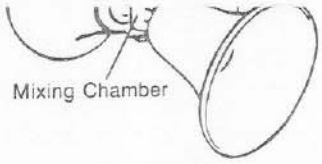


FIGURE 4
Horns Extend Downward at 10°

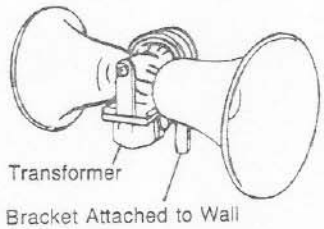


FIGURE 5
Horns Extend Outward from Wall at 10°

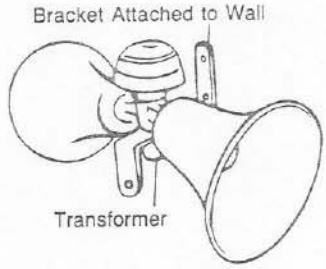


FIGURE 6
Horns Extend Downward at 10°

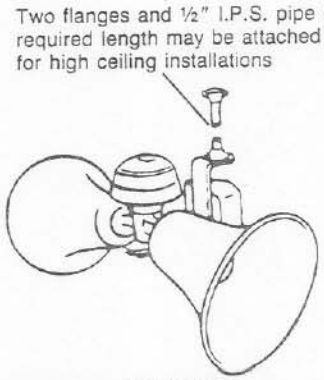


FIGURE 7
Horns Extend Downward at 10°

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

uniform direct field, their coverage patterns should be only slightly overlapped, so that each section of the audience is covered by a single speaker. To the extent this ideal is achieved, reverberation is minimized and intelligibility is maximized.

The following material explains these concepts in more detail and illustrates two design approaches.

What is Reverberation?

Reverberation is the persistence of sound within an enclosure, such as a room, after the original sound has ceased. Reverberation may also be considered as a series of multiple echoes so closely spaced in time that they merge into a single continuous sound. These echoes decrease in level with successive reflections, and eventually are completely absorbed by the room.

Non-Reverberant Environments

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

Variations in Level Due to Distance for Non-Reverberant Environments

In non-reverberant environments, such as outdoors, sound pressure level will be reduced by half (6 dB) every time the distance form the speaker is doubled (this is called the inverse-square law). Figure A shows the dB losses to be expected as distance from the speaker is increased from the one-meter (3.28-foot) measuring distance typically used in SPL specifications.

Reverberant Environments

Where sound is reflected from walls and other surfaces, there is a point beyond which the "reverberant field" dominates and the sound pressure level is higher and more constant than predicted by using the inverse-square law alone.

Variations in Level Due to Distance for Reverberant Environments

The reverberant field will begin to dominate typically at distances of 10 to 30 feet. This distance is greatest for the least reverberant rooms and speakers with narrow beamwidth angles. The frequency and beamwidth specifications provided by the data sheet are still required to obtain satisfactory distribution of the direct sound (or direct field) from the loudspeaker(s), which still follows the inverse-square law. It is the direct signal that contributes to speech intelligibility. This is why the sound system designer should seek a uniform direct field, with as little reverberant field as possible. For example, consider a single speaker with a wide beamwidth angle used to cover a long, narrow, reverberant room. The direct field will be so far below the reverberant field at the back of the room that speech will probably be unintelligible.

Calculating Variations in Level Due to Changes in Electrical Power

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

Power Handling

The power rating of a speaker must be known to determine whether a design is capable of meeting the sound pressure level requirements of the system. The power rating combined with the sensitivity will enable a system designer to calculate the maximum sound pressure level attainable at a given distance.

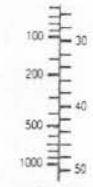


FIGURE A
Level Variation With Distance

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 that exist in voice and music program. This difference between the peak 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 Beamwidth 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 intelligibility.

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 Mapping 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 developed a special adaptation 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 Guide.

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