SPECIFICATIONS

Horizontal Beamwidth:
100° @2.0 kHz (see Figure 2)

Vertical Beamwidth:
60° @ 2.0 kHz (see Figure 2)

Directivity Factor R_θ (Q):
15.9 @ 2.0 kHz (see Figure 3)

Usable Low-Frequency Limit:
250 Hz

Construction:
Non-resonant glass fibre reinforced polyester compression molding with self-colored grey finish. Positive-lock painted steel U-bracket.

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,
Height:
36.8 cm (14.5 in.)
Width:
69.2 cm (27.5 in.)
Depth:
38.1 cm (15.0 in.)

Net Weight:
3.2 kg (7.0 lb)

Shipping Weight:
4.5 kg (10.0 lb)

Recommended Drivers:

ID30C-8	7110XC
ID30C-16	1824S
ID30CT	1828
ID60C-8	1828T
ID60C-16	
ID60CT	
ID75	

Cobreflex III Folded Sectoral Horn

DESCRIPTION

The University Sound Cobreflex III is a folded sectoral, wide-angle horn for use in public address, paging, and voice warning systems.

This folded sectoral construction results in both compactness and high efficiency when combined with the appropriate University Sound compression drivers.

The patented (patent #4,176,731) folded design features two separate air columns in a single assembly which virtually eliminates high-frequency phase cancellation present in re-entrant designs.

The 100° horizontal by 60° vertical dispersion pattern is beneficial in many applications requiring a wide coverage pattern. Furthermore, excellent loading is maintained to a low-frequency cutoff of 250 Hz.

The Cobreflex III is constructed from a non-resonant glass fibre reinforced polyester with a self-colored grey finish. A serrated positive-lock "U" mounting bracket is provided for maximum mounting flexibility and ease of installation.
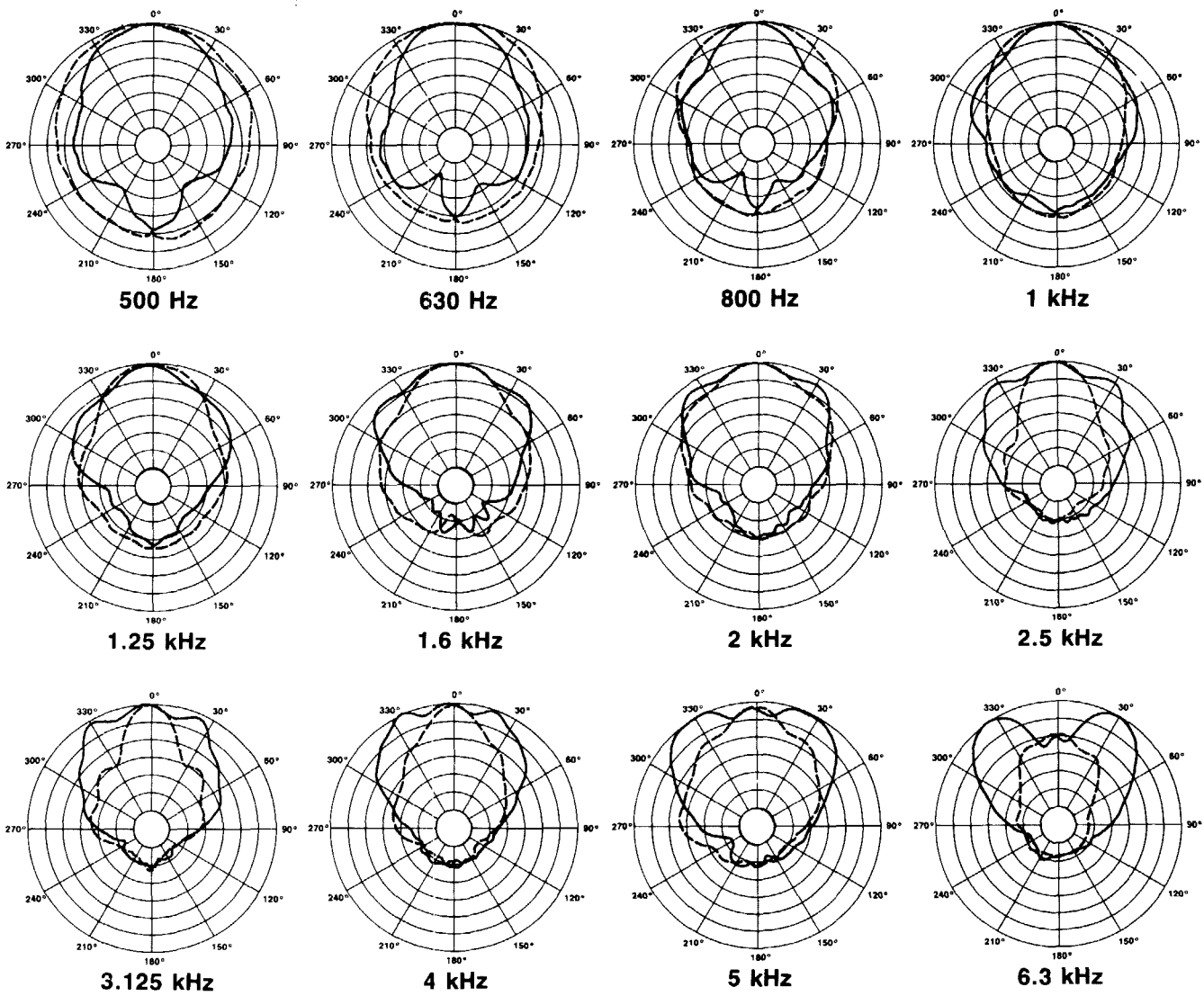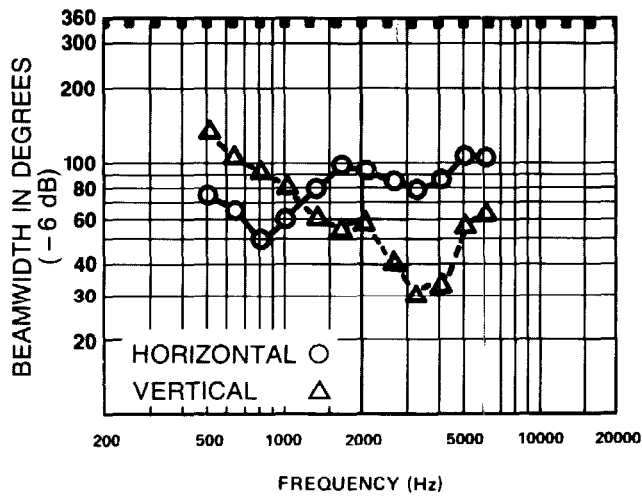
FIGURE 1
Cobreflex III Polar Response

500 Hz   630 Hz   800 Hz   1 kHz

1.25 kHz   1.6 kHz   2 kHz   2.5 kHz

3.125 kHz   4 kHz   5 kHz   6.3 kHz

FIGURE 2
Cobreflex III Beamwidth vs. Frequency
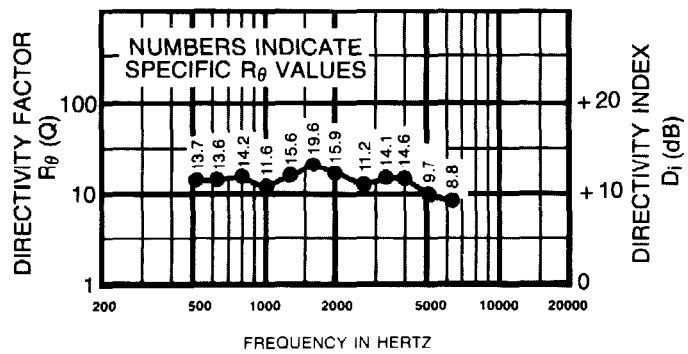

FIGURE 3
Cobreflex III Directivity Factor and
Directivity Index vs. Frequency

POLAR RESPONSE

The directional characteristics of the Cobreflex IIB, with driver attached, 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 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 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 Cobreflex IIB's 6-dB-down total included beamwidth angle is shown in Figure 2 for each one-third-octave center frequency.

DIRECTIVITY

The axial directivity factor R_θ (formerly Q) of the Cobreflex IIB horn was computed at each one-third-octave center frequency from the horizontal/vertical polars and is displayed in Figure 3.

ARCHITECTS' AND ENGINEERS' SPECIFICATIONS

The horn shall be of the reflex type featuring two separate air columns within the single assembly. It shall produce a horizontal beamwidth of 80° and a vertical beamwidth of 60° at 2 kHz. In addition, it shall provide useful acoustic loading at all frequencies above 250 Hz.

The horn shall be constructed from a high-impact acrylonitrile butadiene styrene (ABS) and finished with an ultraviolet inhibiting grey paint.

A serrated, positive-lock "U" mounting bracket shall be affixed to the bell by self-locking nuts and shall provide orientation adjustment in all three planes.

The horn shall possess a throat of 1.91 cm (0.75 in.) diameter and shall be provided with a 1⅜"-18 thread for the mounting of a compression driver. The horn shall be 23.5 cm (9.3 in.) high, 47.0 cm (18.5 in.) wide and 26.0 cm (10.3 in.) deep. It shall weigh no more than 2.3 kg (5.1 lb).

The horn shall be the University Sound model Cobreflex IIB reflex horn.

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.

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

DESIGNING FOR INTELLIGIBILITY AND ADEQUATE SPL

The Basic Idea

Many sound systems would have better performance if the following basic principles are kept in mind. Speakers with the appropriate coverage patterns should be chosen, aimed and powered to achieve a uniform direct field in the highly absorbtive audience, with no sound aimed at the reflective wall and ceiling surfaces. Where multiple speakers are required in order to achieve a 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
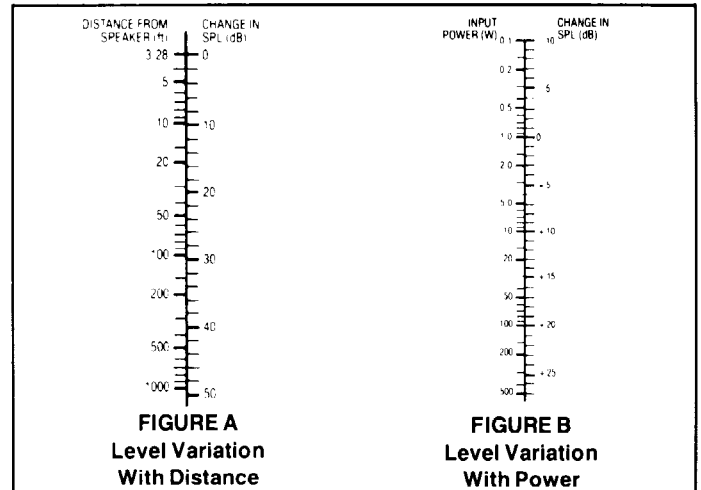
Powering to Achieve Both Average and Peak SPL

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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