University Sound.

a MARK IV company

SPECIFICATIONS

Horizontal Beamwidth:
150° @ 2 kHz (see Figure 2)

Vertical Beamwidth:
110° @ 2 kHz (see Figure 2)

Directivity Factor R_6 (Q):
5.2 @ 2 kHz

Usable Low-Frequency Limit:
260 Hz

Construction:
Large fiberglass compression molding with gray finish, front horn of gray diecast zinc and phenolic compression-molded inner horns with steel "U" bracket.

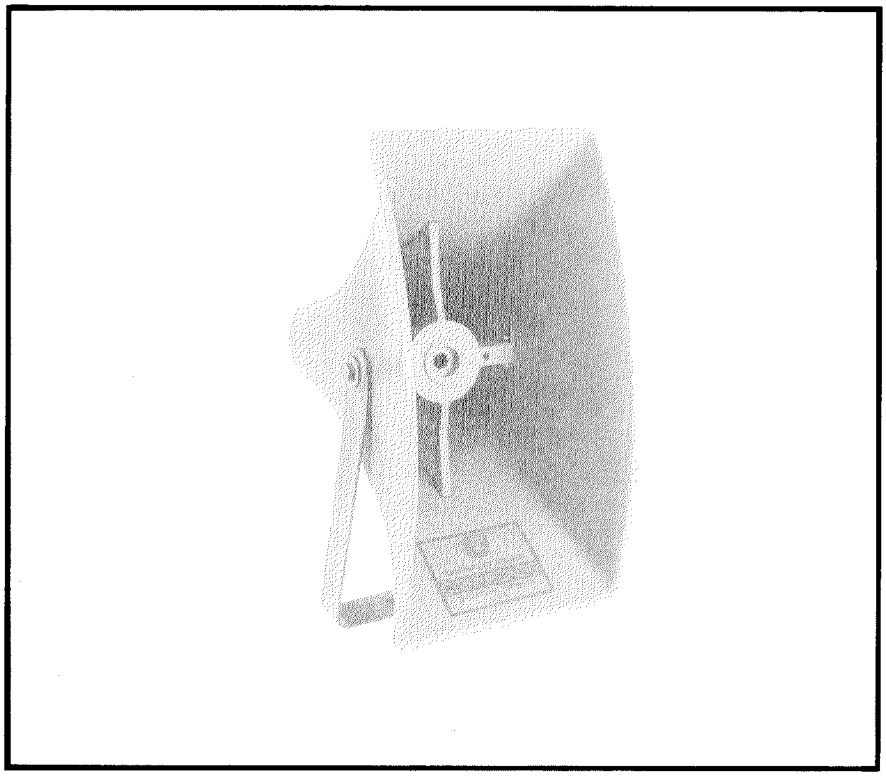
Mechanical Connection of Driver:
Threaded metal throats to accept a screw-in compound driver with a throat opening of 0.7 inch to 1.0 inch diameter and a standard 1⅜-inch thread.

Dimensions,
Height:
52.0 cm (20.5 in.)
Width:
26.5 cm (10.5 in.)
Depth:
51.0 cm (20.0 in.)

Net Weight:
4.9 kg (10.8 lb)

Shipping Weight:
5.4 kg (11.8 lb)

Recommended Drivers:
1828C
1828T
1829
1829T



FC100 Compound Diffraction Horn

DESCRIPTION

The University Sound FC100 consists of two horn sections for use with 1828C or 1829 model drivers to form a wide-range, integrated system.

The folded construction of the rear horn coupled with the smaller dimensions of the front horn, present a 1,000 Hz acoustic crossover. This separation of frequencies provides a more extended frequency response and cleaner sound.

The 150° horizontal by 110° vertical dispersion pattern is beneficial in many applications requiring a wide coverage pattern. Furthermore, excellent loading is maintained to a low-frequency cutoff of 260 Hz.

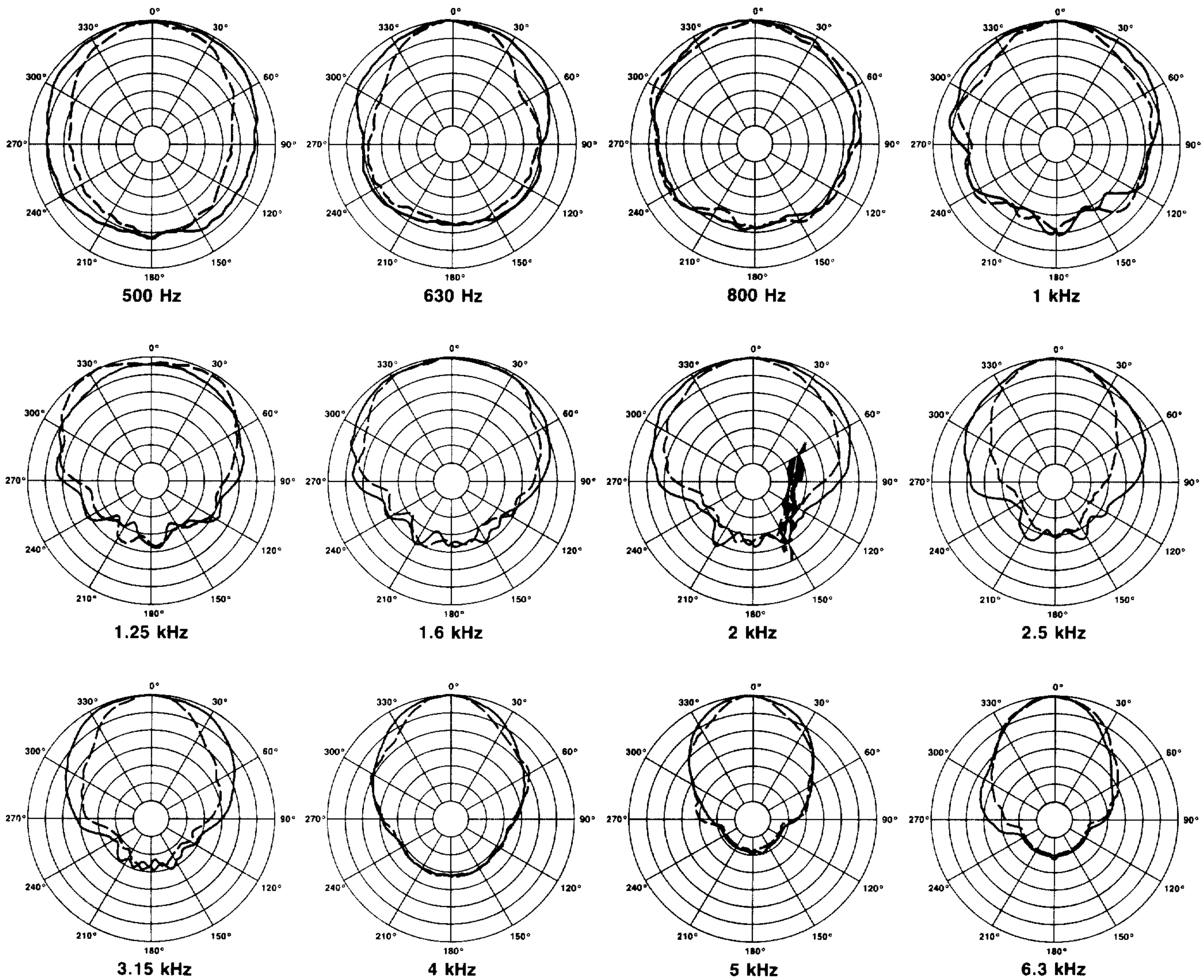


FIGURE 1
FC100 Polar Response

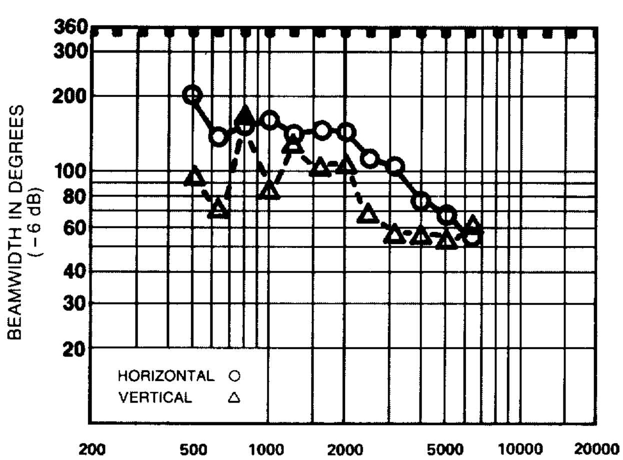


FIGURE 2
FC100 Beamwidth vs. Frequency

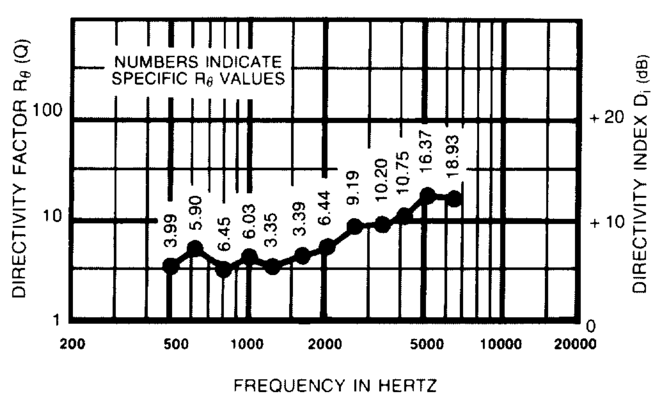


FIGURE 3
FC100 Directivity Factor and Directivity Index vs. Frequency

POLAR RESPONSE

The directional characteristics of the FC100, 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 FC100'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 FC100 horn was computed at each one-third-octave center frequency from the horizontal/vertical polars and is displayed in Figure 3.

INSTALLATION

As shipped, the "U" bracket is in position for vertical mounting. For horizontal dispersion, or for mounts where bracket mounting holes must be vertical, move bracket to the rear mounting position. The horn can be mounted in a variety of horizontal and vertical configurations by using adjustments of the swivel connections (bracket to horn).

ARCHITECTS' AND ENGINEERS' SPECIFICATIONS

The horn shall be the compound diffraction type with outer housing of fiberglass, a zinc diecast front horn and phenolic-constructed inner horns.

The low-frequency horn will be 52.0 cm (20.5 in.) high by 26.5 cm (10.5 in.) wide and 51.0 cm (20.0 in.) deep, not including a driver. Net weight (less driver) shall not exceed 4.9 kg (10.8 lb).

A separate high-frequency horn shall be provided, capable of individual rotation. The acoustical crossover shall be 1,000 Hz.

The loudspeaker shall be capable of satisfactory mechanical performance in the temperature range from −40°C (−40°F) to +71°C (+161°F) not subject to sunlight embrittlement and resistant to damage from weather, moisture, and fungus.

A steel swivel bracket capable of either vertical or horizontal installations and a variety of adjustments is provided. The University Sound FC100 is specified.

WARRANTY (Limited) — University Sound Speakers and Speaker Systems (excluding active electronics) are guaranteed for five years from date original purchase against malfuntion 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 specfied 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.

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.

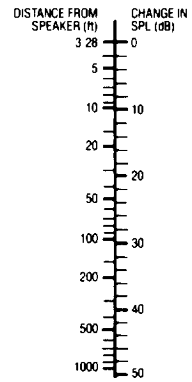


FIGURE A
Level Variation With Distance

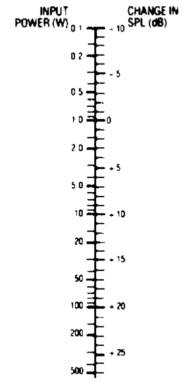


FIGURE B
Level Variation With Power

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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