™University Sound®

a MARK IV company

SPECIFICATIONS

Frequency Response:
280-8,000 Hz ±5 dB
(see Figure 3)

Power Handling,
8 Hours, 6-dB Crest Factor:
60 watts (500-5,000 Hz pink noise)

Transformer Taps and Impedances:
See Table I

Sound Pressure Level, at 1 Meter,
1 Watt Input Averaged, Pink Noise
Band-Limited from 500 to 5,000 Hz:
105 dB

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

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

Directivity Factor R_θ (Q):
5.2 @ 2 kHz

Usable Low-Frequency Limit:
180 Hz

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

Voice-Coil Diameter:
5.08 cm (2.0 in.)

Magnet Weight:
0.45 kg (1.00 lb)

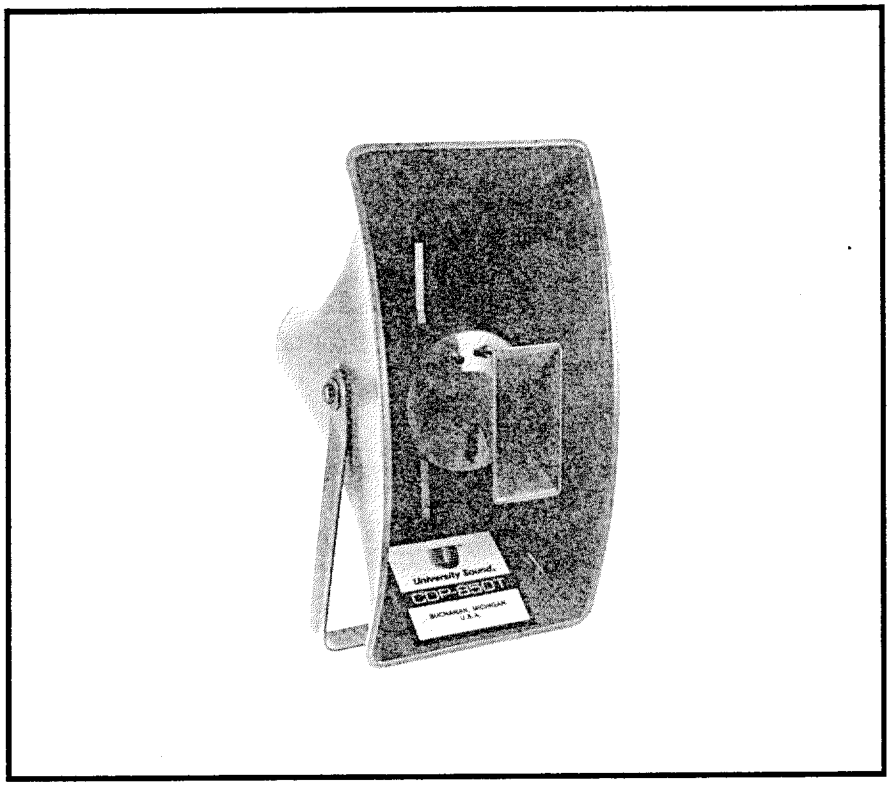
Magnet Material:
Strontium ferrite

Flux Density:
1.35 Tesla

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

Net Weight:
8.4 kg (19 lb)

Shipping Weight:
9.5 kg (21.0 lb)



850T

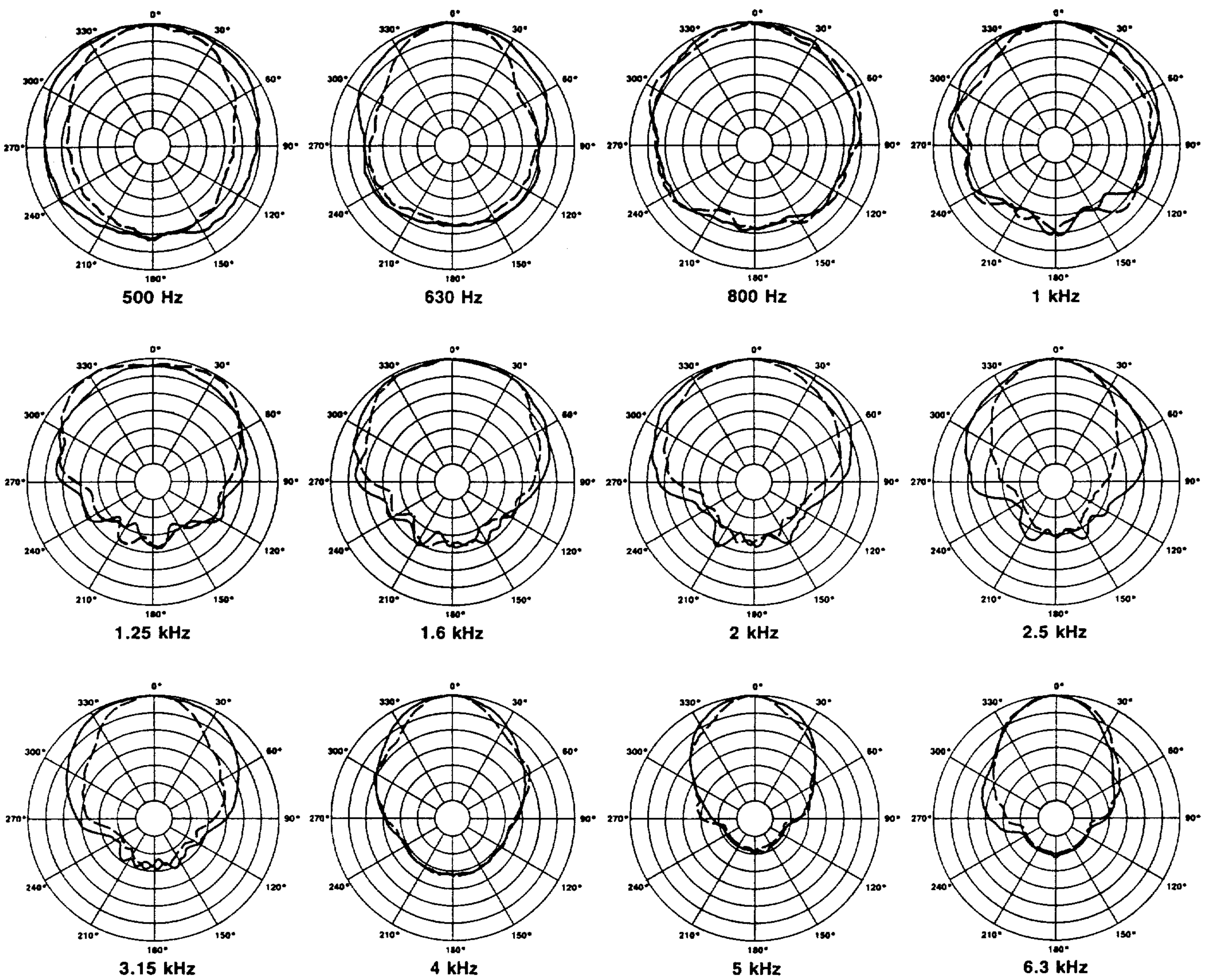
Compound Diffraction Horn

DESCRIPTION

The University Sound Model 850T is a wide-range, integrated horn and driver system with a single driver unit having two coaxial horns coupled to opposite sides of the driver diaphragm.

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 high-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 180 Hz.



500 Hz 630 Hz 800 Hz 1 kHz

1.25 kHz 1.6 kHz 2 kHz 2.5 kHz

3.15 kHz 4 kHz 5 kHz 6.3 kHz

HORIZONTAL ——
VERTICAL - - - -

FIGURE 1
850T Polar Responses

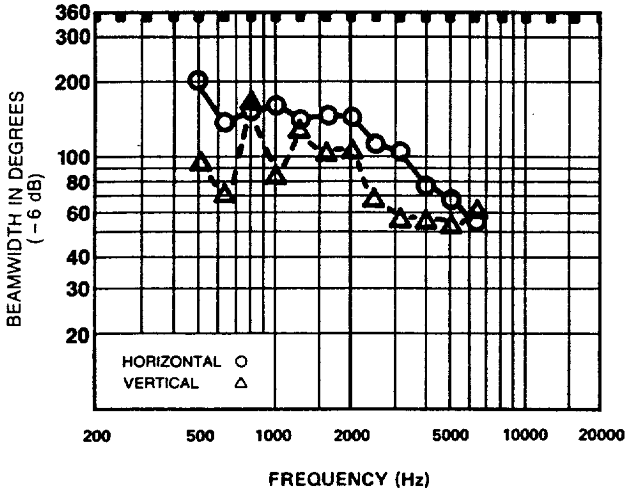


FIGURE 2
850T Beamwidth vs. Frequency

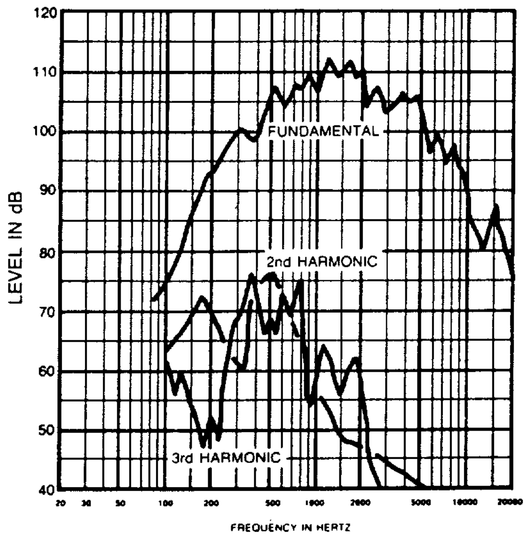


FIGURE 3
850T Frequency Response
(1 watt at 1 meter)

POLAR RESPONSE

The directional characteristics of the 850T, 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 850T's 6-dB-down total included 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 850T. It was measured at a distance of 1 meter, using a swept sine wave.

INSTALLATION

As shipped, the "U" bracket is in position for vertical mounting. For horizontal dispersion, (or for mounts where the 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).

TRANSFORMER

A transformer and power selector switch are installed in the rear housing. Power taps for the transformer are listed in Table I.

LOW-FREQUENCY DRIVER PROTECTION

When frequencies below the low-frequency cutoff for the horn assembly are fed to the driver, excessive current may be drawn by the driver. For protection of driver, amplifier, and transformer, capacitor(s) in series with driver, or transformer primary are recommended. Table I (above) indicates recommended values. The values shown are for 200 Hz. Values for other frequencies can be determined by using the formula:

$$C = \left[C_{200} \times \frac{200}{f} \right]$$

C_{200} = Values shown in the following table

f = New Frequency

	70-Volt Lines	
Power	**Impedance**	**Capacitance**
60 W	83	10
30 W	166	5
15 W	333	2
8 W	625	1

TABLE I — Series Protection Capacitors for 200 Hz and Below

ARCHITECTS' AND ENGINEERS' SPECIFICATIONS

The loudspeaker shall be of the integrated driver and horn style, utilizing two coaxial horns coupled to opposite sides of the driver diaphragm and a larger horn compression-molded from fiberglass, a zinc die-cast front horn and phenolic-constructed inner horns. The driver uses a high-temperature rated 5.2-cm (2.0-inch) diameter voice coil.

The axial frequency response will extend from 280-8,000 Hz and the horn shall exhibit a low-frequency cutoff of 180 Hz. Sound pressure level will be 105 dB (1 W/1 M) with a 500-5,000 Hz pink noise signal applied, and the horn will produce a horizontal beamwidth of 150° and a vertical beamwidth of 110° at 2 kHz. The horizontal coverage shall be constant over the frequency range of 3 kHz to 10 kHz.

The loudspeaker shall be compression-molded fiberglass capable of satisfactory mechanical performance in the temperature range from −40°C to +40°C and not subject to sunlight embrittlement. Other major external speaker parts shall be die-cast zinc finished in gray polyester paint to match the molded horn parts. All components shall be resistant to damage from weather, moisture and fungus.

A swivel bracket capable of providing either vertical or horizontal installation and a variety of adjustments, is provided.

The loudspeaker shall be 52.0 cm (20.5 in.) high, 26.5 cm (10.5 in.) wide and 51.0 cm (20.0 in.) long. The loudspeaker shall be the University Sound 850T, which includes a 70-V transformer and weighs no more than 8.4 kg (19.0 lb).

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.

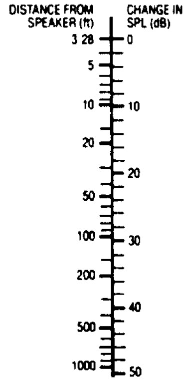


FIGURE A
Level Variation With Distance

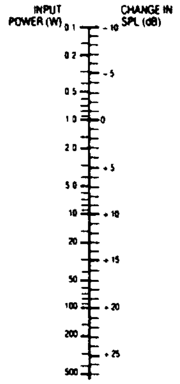


FIGURE B
Level Variation With Power

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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