University Sound, Inc.
a MARK IV company

UPI-122

PERMANENT INSTALLATION SPEAKER SYSTEM

SPECIFICATIONS

Frequency Response:
75-17,000 Hz ± 5 dB (see Figure 3)

Usable Low-Frequency Limit (10-dB-down point):
49 Hz

Power Handling:
8 Hours, 6 dB crest factor
200 watts (per ANSI/EIA RS-426-A 1980)

Impedance,
Nominal: 8 ohms
Minimum: 6.3 ohms

Sound Pressure Level at 1 Meter, 1 Watt Input, Anechoic Environment, Band-Limited Pink-Noise Signal, 500 to 5,000 Hz:
97 dB

Horizontal Beamwidth:
90° @ 4 kHz (see Figure 2)

Vertical Beamwidth:
40° @ 4 kHz (see Figure 2)

Directivity Factor R_θ(Q)
17.6 @ 4 kHz

Transducer Complement,
High-Frequency:
2.5-cm (1-inch) compression driver
Low-Frequency:
30-cm (12-inch) woofer

Box Tuning Frequency:
45 Hz

Crossover Frequency:
3,500 Hz

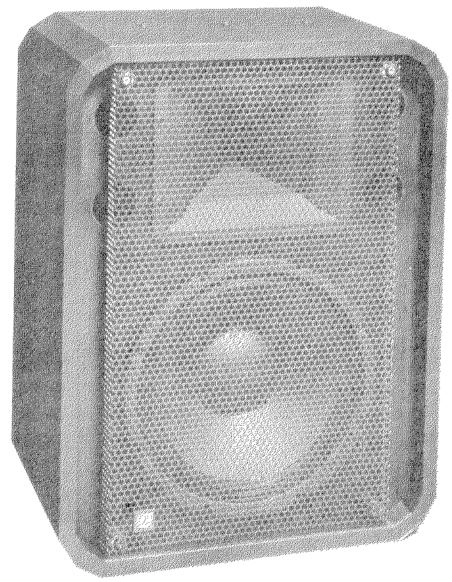
Enclosure Materials:
High-density particle board covered with black vinyl. A heavy-duty black, powder-coated grille is provided.

Optional Accessories:
WCB-3, mounting bracket

Dimensions:
60.5 cm (23.8 in.) high,
45.7 cm (18.0 in.) wide,
31.0 cm (12.2 in.) deep

Net Weight
25.0 kg (55 lb)

Shipping Weight
27.7 kg (61 lb)



DESCRIPTION

The University Sound UPI-122 is a wide-range, high-performance loudspeaker system intended for reproduction of high-quality music program. It is ideally suited for indoor applications requiring high-quality sound reproduction. Its high power handling also makes the UPI-122 the choice of professional users as a foreground loudspeaker in restaurants and clubs. Threaded inserts in the cabinet, in combination with the optional mounting hardware, provide a flexible mounting system for virtually any application.

The low-frequency section is a 12-inch direct radiating woofer installed in an optimally vented enclosure. This combination produces an exceptionally extended bass response with high efficiency for a relatively small enclosure. The high-frequency section is a 1-inch compression driver coupled to a constant-directivity, 90 degree by 40 degree horn.

ARCHITECTS' AND ENGINEERS' SPECIFICATIONS

The loudspeaker shall be a two-way system consisting of a 30-cm (12-inch) low-frequency loudspeaker, 2.5-cm (1-inch) high-frequency compression driver coupled to a 90 degree by 40 degree constant-directivity horn. The dividing network crossover frequency shall be 3,500 Hz. The loudspeaker system shall meet the following performance criteria: Power handling: 200 watts per ANSI/EIA RS-426-A 1980. Frequency response: ±5 dB from 75 Hz to 17 kHz. Pressure sensitivity: 97 dB SPL at one watt, 500 Hz to 5 kHz measured at a distance of one meter on axis. Impedance: 8 ohms nominal, 6.3 ohms minimum. The enclosure shall be constructed of high-density particle board. The unit shall be 60.5 cm (23.8 inch) high, 45.7 cm (18.0 inch) wide, 31.0 cm (12.2 inch) deep. The loudspeaker system shall be the University Sound model UPI-122.

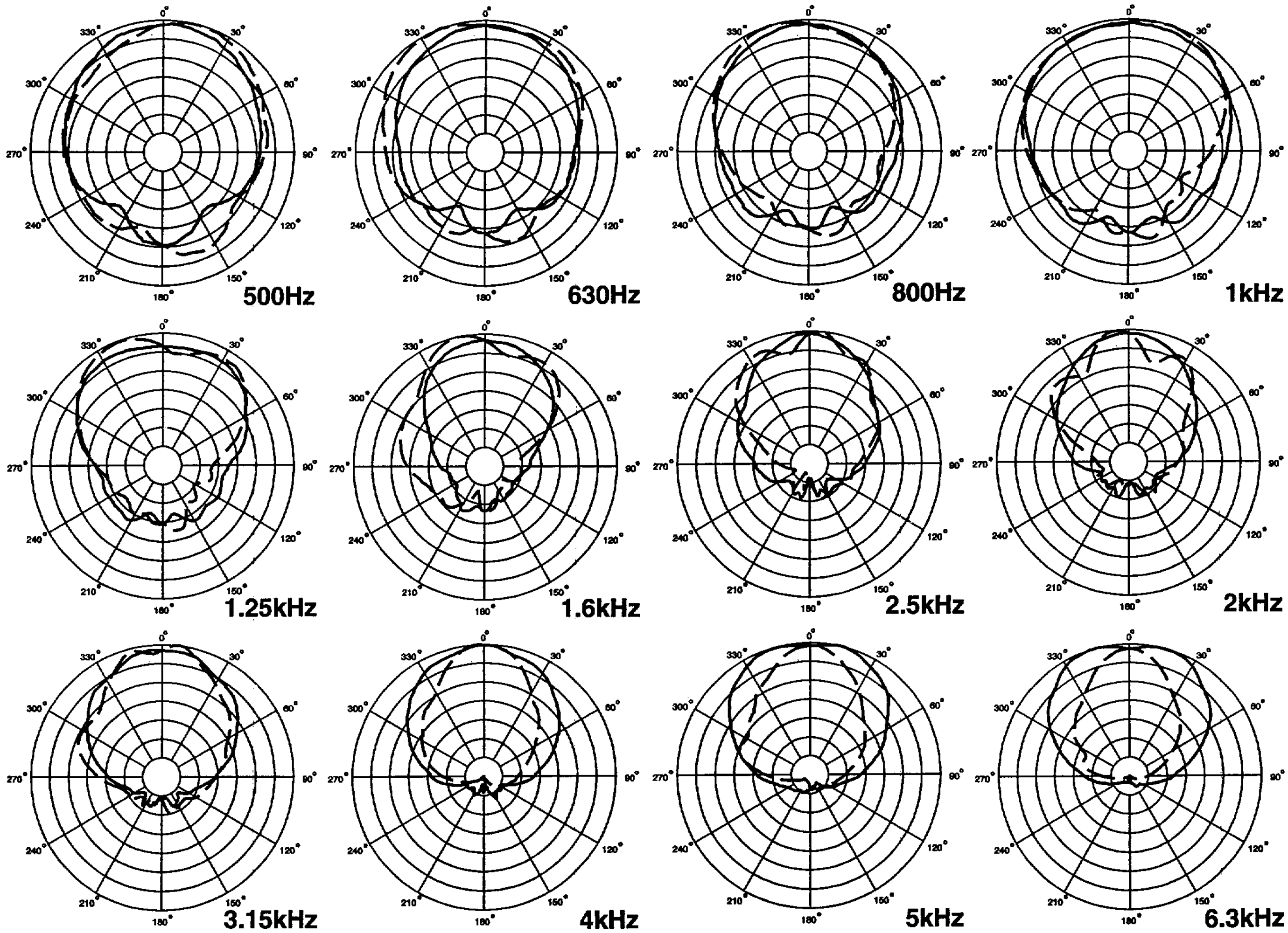


FIGURE 1
UPI-122 Polar Response

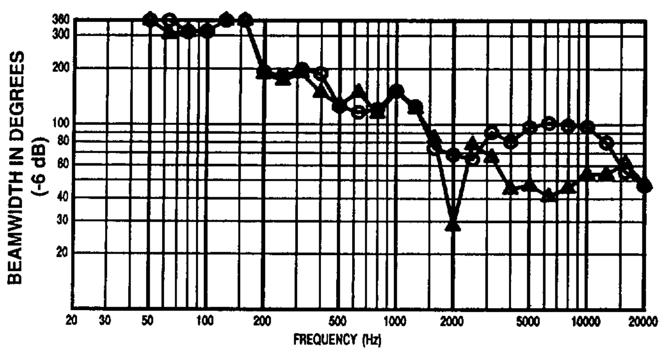


FIGURE 2
UPI-122 Beamwidth vs. Frequency

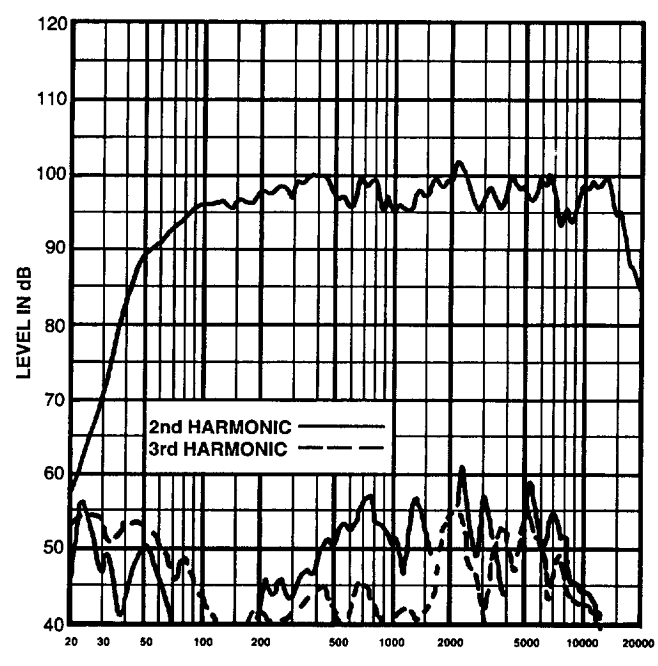


FIGURE 3
UPI-122 Frequency Response
(1 watt at 1 meter)

POLAR RESPONSE

The directional characteristics of the UPI-122 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 UPI-122 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 UPI-122. It was measured at a distance of 1 meter, using a swept sine wave.

LINE-TRANSFORMER KIT

The TM60 (25/70V) line-transformer kit is an option for high-impedance systems generally used in multi-speaker designs and some smaller systems using long speaker-wire runs. A University Sound TM60 transformer can be mounted on the input panel supplied with the UPI-122. The TM60 allows direct input to the system or access to any of seven transformer taps covering 7.5, 15, 30, and 60 watts at 25 and 70 volts. Connections are made on barrier strips with 8-32 screws.

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.

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.

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.

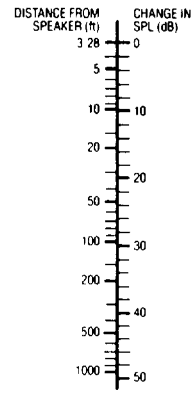


FIGURE A
Level Variation With Distance

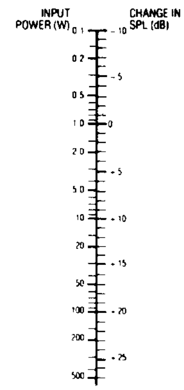


FIGURE B
Level Variation With Power

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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