University Sound.
a MARK IV company

SPECIFICATIONS

Frequency Response:
45-16,000 Hz ±5 dB
(see Figure 3)

Power Handling:
20 watts (EIA RS-426A)

Impedance,
Nominal:
8 ohms
Minimum:
8 ohms

Sound Pressure Level at 1 Meter,
1 Watt Input, 200-4,000 Hz Average:
93 dB

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

Magnet Weight:
0.37 kg (0.81 lb)

Magnet Material:
Strontium ferrite

Flux Density:
0.9 Tesla

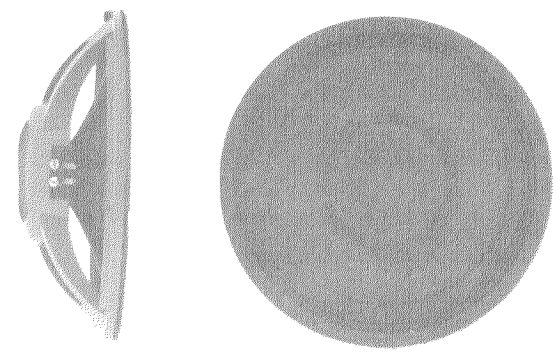
Magnet Frame:
Diecast zinc

Color, Frame:
Gray

Dimensions,
Diameter:
31.1 cm (12.25 in.)
Height:
8.9 cm (3.50 in.)

Net Weight:
2.5 kg (5.4 lb)

Shipping Weight:
3.2 kg (6.9 lb)



MC12A Michigan® Component Speaker

DESCRIPTION

The University Sound MC12A is a high quality twelve-inch, full-range loudspeaker for distributed sound systems.

A small centrally-mounted, free-edge cone is utilized for an extended response and to improve high-frequency dispersion.

The MC12A is suitable for use in applications requiring highly intelligible speech or smooth musical reproduction.

To insure long-term reliability in installations, the MC12A is designed to handle 20 watts continuous power (80 watts peak, short term) of shaped white noise signal for eight hours per EIA Standard RS-426A.

For constant-voltage distribution systems, a University Sound TM5, TR5, or TR15 line-matching transformer can be used in conjunction with the MC12A.

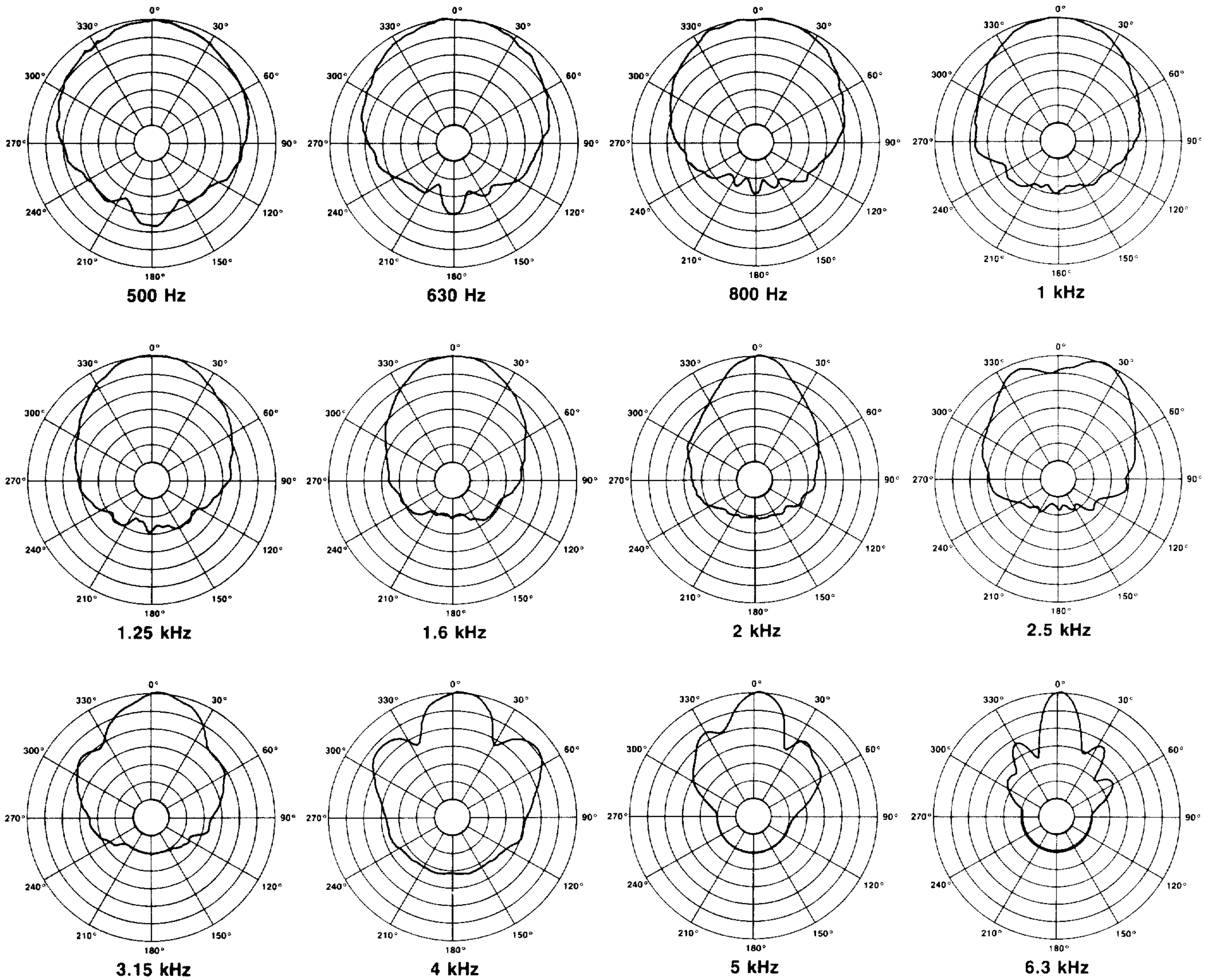


FIGURE 1
MC12A Polar Response

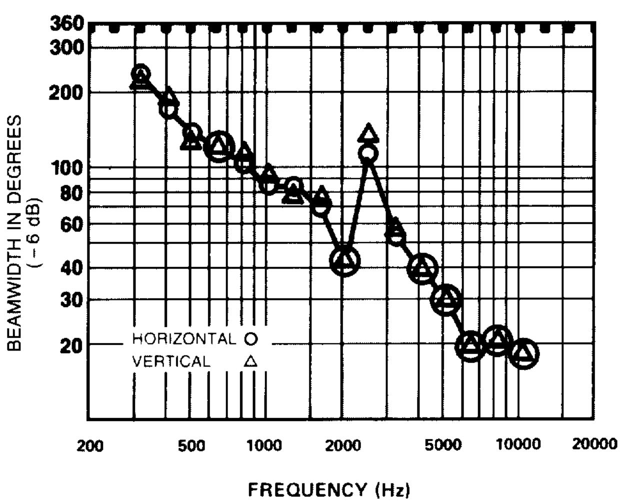


FIGURE 2
MC12A Beamwidth vs. Frequency

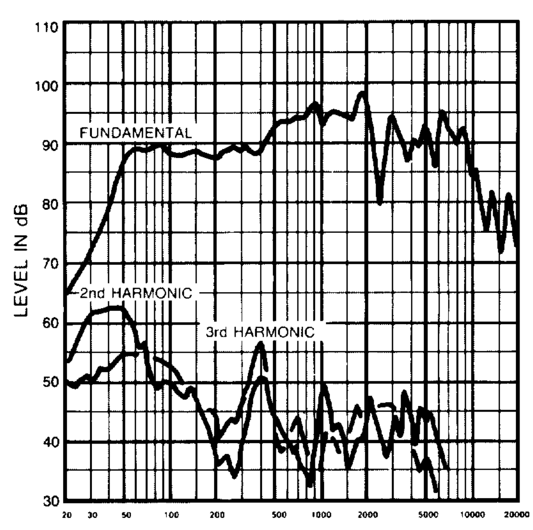


FIGURE 3
MC12A Frequency Response
(1 watt at 1 meter)

DIRECTIONAL PERFORMANCE

The directional characteristics of the MC12A in a 12-cubic-foot vented enclosure were measured by running a set of polar responses in University's large anechoic chamber. The test signal was ⅓-octave-band-limited pseudo-random pink noise centered at the ISO standard frequencies indicated in Figure 1.

POWER HANDLING TEST

The MC12A is designed to withstand the power test described in EIA Standard RS-426A. The EIA test spectrum is applied for eight hours. To obtain the spectrum, the output of a white noise generator (white noise is a particular type of random noise with equal energy per bandwidth in Hz) is fed to a shaping filter with 6-dB-per-octave slopes below 40 Hz and above 318 Hz. When measured with usual constant-percentage-bandwidth analyzer (one-third-octave), this shaping filter produces a spectrum whose 3-dB-down points are at 100 Hz and 1,200 Hz with a 3-dB-per-octave slope above 1,200 Hz. This shaped signal is sent to the power amplifier with the continuous power set at 20 watts into the EIA equivalent impedance (12.7 volts true RMS). Amplifier clipping sets instantaneous peaks at 6 dB above the continuous power, or 80 watts peak (25.2 volts peak). This procedure provides a rigorous test of both thermal and mechanical failure modes.

RECOMMENDED ENCLOSURES AND BAFFLES

The MC12A is designed for use with any back enclosure with a diameter of 12.25 inches or greater and a depth of at least 3.5 inches. Larger back volumes will increase the lower frequency output. The frequency response of the MC12A in 12 cubic-foot enclosures is shown in Figure 3.

MOUNTING

The MC12A may be rear-mounted only and requires a 2.80 cm (11.0 in.) diameter cutout and a 2.94 cm (11.56 in.) bolt circle. Normal fasteners up to 5 mm (0.20 in.) will fit through the four holes in the frame.

ARCHITECTS' AND ENGINEERS' SPECIFICATIONS

The University MC12A shall be a dual-cone loudspeaker with a nominal diameter of 31.1 cm (12.25 in.), an overall depth of 8.9 cm (3.50 in.), and shall weigh no more than 2.5 kg (5.4 lb). The voice coil shall have a nominal diameter of 5.08 cm (2.0 in.), and shall operate in a gap of not less than 0.9 Tesla (9,000 Gauss). High frequencies shall be reproduced by a 10.9 cm (4.3 in.) free-edge cone attached to the apex of the low-frequency device.

The loudspeaker shall exhibit a sensitivity (SPL, 1 W at 1 m [3.28 ft] averaged 200-4,000 Hz) of no less than 93 dB on axis maintaining an essentially smooth response with 5-dB-down points at 45 Hz and 16,000 Hz in a 12-cubic-foot sealed box in a free field. The half-space reference efficiency shall be 1.05%. The nominal impedance shall be 8 ohms and the dc resistance shall be 7.5 ohms. The loudspeaker shall be capable of handling a continuous 20 watt (12.7 volts true RMS) shaped white-noise random signal (as per EIA Standard RS-426A) with a 6-dB crest factor for eight hours.

The loudspeaker shall be the University Sound model MC12A.

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.

BASIC GUIDELINES FOR DISTRIBUTED CEILING SPEAKER SYSTEM

Concept. The basic goals for a distributed ceiling speaker system are intelligibility and adequate SPL. Speakers with the proper coverage pattern should be chosen, spaced appropriately and powered to achieve a uniform direct field at listener ear level.

Even Coverage vs. Cost. Uniformity of sound coverage for a ceiling speaker installation increases with greater speaker density, but the cost of the installation also goes up.

Two basic loudspeaker placement patterns are normally used. These are the traditional square and hexagonal patterns as shown in Figure A. For the square pattern either one side of the square or one diagonal is aligned parallel to one of the room walls. In the case of the hexagonal pattern, one of the diagonals is usually aligned parallel to one of the walls.

For each of the patterns a choice should be made as to the amount of overlap. These are referred to here as 1) edge to edge, 2) minimum overlap and 3) center to center. These options are also shown in Figure A. There will be maximum and minimum SPL levels (relative to the on-axis SPL for a single speaker), and the difference between the SPL_{max} and SPL_{min} gives an indication of the quality of the installation.

Table 2 gives typical values for the six basic patterns. A 2-dB (or less) variation in SPL will be virtually imperceptable, whereas a 6-dB variation might be significant, but again may be adequate for many installations. At this stage the installer needs to make a cost vs. quality-of-coverage decision.

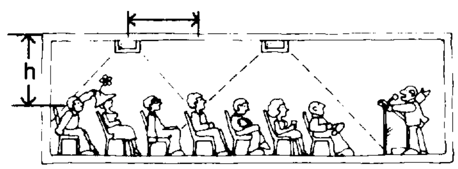
The radius 'r' of the coverage circle is calculated using the formula below, where θ is the -6 dB beamwidth at the highest frequency of interest and 'h' is the distance between the ceiling and ear level (determined by whether the audience is seated or standing).

$$\frac{r}{h} = \tan\theta$$

Example. The CS810 is to be used in an installation requiring speech reinforcement, so an upper frequency limit of 4 kHz is selected, and 'h' is 6 feet. From the beamwidth curve $\theta = 45°$.

$$r = \tan\theta \times h = 6 \text{ feet}$$

Adequate Headroom. Speakers used in distributed systems almost always use matching transformers in order to economically distribute amplifier power to each loudspeaker.

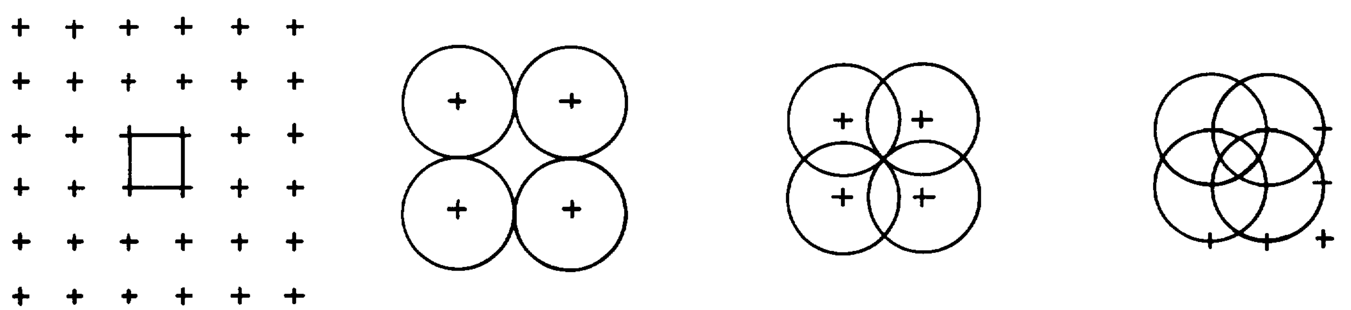


	L_{max}(dB)	L_{min}(dB)	$L_{max}L_{min}$(dB)
Square Edge to Edge	0.66	−3.69	4.35
Hexagonal Edge to Edge	0.95	−4.45	5.40
Square Minimum	2.02	−0.02	2.04
Hexagonal Minimum	1.36	−1.23	2.59
Square Center to Center	5.17	3.78	1.39
Hexagonal Center to Center	5.38	4.21	1.17

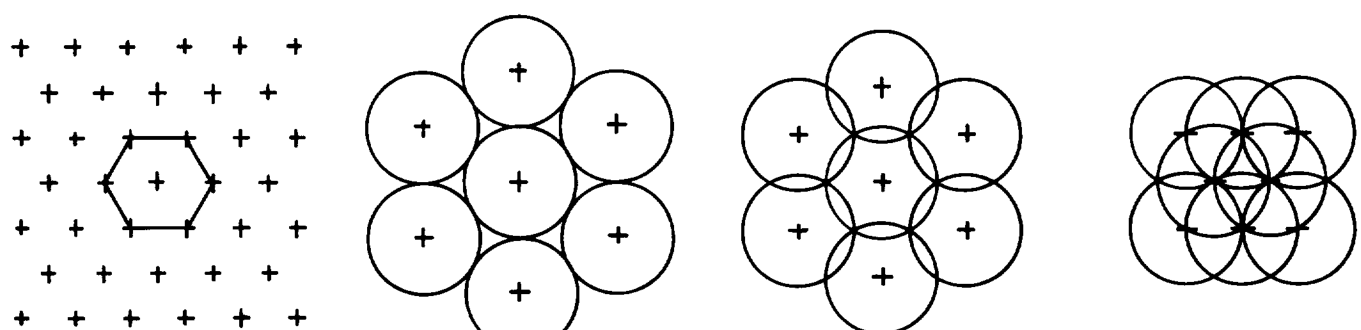
TABLE 2 — SPL changes for various patterns relative to on-axis value for a single speaker.

It is a simple matter to choose the appropriate transformer tap based upon the average SPL desired, the loudspeaker sensitivity, and the distance between the loudspeaker and the listener. The tap selected for a speaker may vary from room to room; however, the total *average* power required is easily calculated by summing the individual loudspeaker power tap settings.

Be aware that short-term peaks which exist in voice and music, although contributing little to perceived loudness, can be 10 dB or more above the average level. Thus, an amplifier with at least 6 dB (four times) headroom above the simple power summation should be used to avoid distortion on peaks.



a) Square Spacing — 1) Edge to Edge — 2) Minimum — 3) Center to Center



b) Hexagonal Spacing — 1) Edge to Edge — 2) Minimum — 3) Center to Center

FIGURE A — Basic Ceiling Speaker Patterns

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