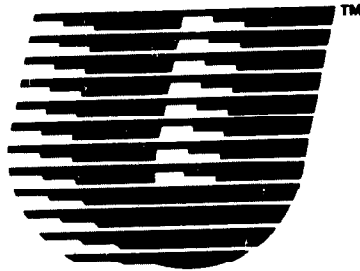
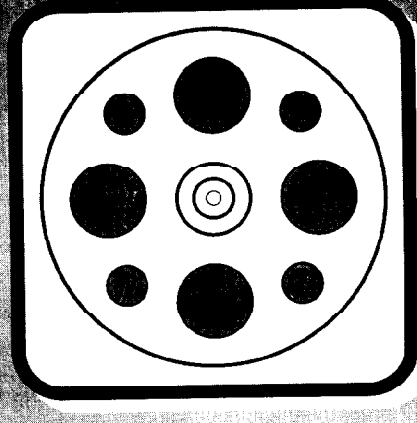


**Commercial
Products
Catalog**



**University
Sound, Inc.**
a MARK IV company

**Second Edition
November, 1989**



An Old Name, A New Company

University is a name long familiar to those in commercial sound. Founded in 1936, it was named "University" because it was originally located across the street from New York University in New York City. Later moved to White Plains, NY, the company flourished and in 1959 was acquired by LTV Corporation. Its new parent moved the company in 1963 to a new manufacturing facility in Oklahoma City, OK.

In 1970, a merger made University Sound a division of Altec Lansing Corporation, a well-known manufacturer of professional/commercial audio products. It was at this time that University first became focused exclusively on commercial sound. Several horn and driver innovations developed under Altec's guidance are evidenced in products currently found in this catalog.

Altec Lansing was acquired by Mark IV Industries, Inc. in 1985. University Sound was merged in 1986 with the commercial products line of Electro-Voice, another Mark IV subsidiary and an equally well-known manufacturer of professional/commercial audio products. The resulting expansion of the University line included many proprietary microphone and speaker products engineered by Electro-Voice. These too remain part of the product offerings found within these pages.

After almost 30 years as a trademark and product line, University Sound became a company again in 1988 with the acquisition by Mark IV of Cetec Corporation. The Raymer division of Cetec was merged with University Sound. This added a complete line of electronics products: amplifiers, tuners, receivers, telephone interconnect equipment and accessories. The resulting NEW company, University Sound, Inc., a full fledged corporation and subsidiary of Mark IV Industries, is housed in a new, 21,000 square foot facility in Sylmar, CA (northeast of Los Angeles). True to its heritage, University still maintains manufacturing and engineering resources at the plants where so much of its history was written.

A New Company, A New Purpose

What is exciting about the formation of University Sound as a separate company is the opportunity to focus on commercial sound. The most comprehensive grouping in the industry of microphones, transducers, and audio and utility electronics has become dedicated to serving the needs of the commercial sound installer and distributor.

There are three guidelines that University will follow in support of its new purpose:

To Provide a Practical Line of Products

University is committed to developing products with engineered-in adaptability and versatility, thereby reducing investment in inventory; to achieving on-time delivery, and to honoring superior product warranties backed by prompt and economical repair service.

To Promote Education in The Industry

University is dedicated to the correct design and specification of commercial sound systems. The company publishes "CONTACT," a widely-read monthly newsletter dealing with educational and informational topics in commercial sound. The company also publishes the "Commercial Sound and Public Installation Guide" to help simplify calculation of area coverage and SPL for speakers. All specification sheets for University Sound products are comprehensive and objective, with practical and useful technical data correlating the true performance of the device with currently agreed-upon standards for predicting performance in acoustical or electrical environments.

To Adapt New Technology For Ordinary Applications

University will continue to develop new products utilizing technologies that have never been applied before in commercial sound. Constant directivity paging projectors and multi-buss signal processing in utility amplifiers are

examples of applications of technology from other parts of the audio field that are finding their way into commercial sound through introduction of products like the University PA+30 paging projector and the 9000 series modular/mixer amplifiers.

An old name, but a new company with a new purpose. What has happened at University Sound is not a mere metamorphosis but a rebirth which will serve the needs of the commercial sound industry in a unique and profitable way.

Applications Suggestions

Throughout this catalog we have used small symbols adjacent to many of the product photographs. These symbols graphically indicate the applications for which the product is suited. The symbols are identified and explained below. Of course, these are only general categories and suggestions; many more applications exist and may be appropriate for individual products.



Audio-Visual

Includes equipment for the audio portion of multi-media presentations, slide shows, video presentations, and small-format (16mm) film presentations.



Entertainment

Describes equipment for the high-level, high-quality sound systems which are used for nightclub performances.



Foreground/Background Music

Describes equipment which is used for low-level background music (possibly with paging), and for occasional situations where music is the central focus. May distribute sound more widely than Entertainment systems, and may not require as high a sound level or wide a bandwidth.



Hazardous Environments

Describes equipment which is safe for use in corrosive and/or explosive environments; i.e., our "110XC" "explosion proof" driver, which will not ignite an explosion in an explosive atmosphere.



Houses of Worship

Describes equipment which is suitable for use in amplifying a sermon, choir or musical group in the typical church or synagogue. Also covers auditoriums, seminar/meeting rooms, etc. where amplification or reproduction is required.



Motion Picture

Describes equipment used for sound reproduction in movie theatres.



Music

Describes equipment for large-scale musical concert sound reinforcement systems; i.e., wide-range, low-distortion sound reinforcement where the sound is an integral part of the primary "center stage" attraction.



Paging

Describes equipment used primarily for making voice announcements (the traditional term for such systems was "PA" or "public address").



Sports

Describes equipment used for making announcements in a sports arena, stadium, gymnasium, etc.



Telephone Interconnect

Describes equipment which interfaces with business telephone systems to enhance and expand the function of such systems to include paging, remote bell-ringing through paging speakers, and so forth.

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An Introduction to University Microphones

Selecting the Right Microphone

Models Tailored to Many Applications

Choose the product that fits the application. Whether you require a microphone for broadcast, recording, public address, sound reinforcement, paging or communications, University offers a model to do the job.

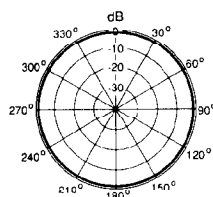
Microphone Pickup Patterns

There are a variety of pickup patterns for microphones. Two are very basic: omnidirectional and directional.

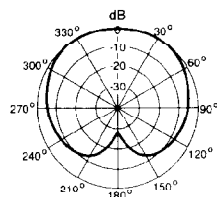
Omnidirectional microphones pick up sound from all directions and often are the best choice if there are no environmental problems (noise, feedback from speakers, etc.). Omnidirectional microphones offer the widest, smoothest response for a given price, and lower sensitivity to breath, wind, and handling noises.

Directional microphones pick up sounds primarily from certain directions or areas and should be used where there are environmental noise problems, where maximum gain-before-feedback is required, or where there are great distances from microphone to sound source. Some directional mics provide bass boost when used close, as explained under "proximity effect" in the following text. Microphones with cardioid (pertaining to "heart shaped") characteristics have greatest sensitivity in the front, lower sensitivity at the sides, and least sensitivity at the rear. Supercardioid mics are similar to cardioid mics, but have a slightly lower front-to-back ratio; instead, their minimum sensitivity occurs in areas symmetrically offset from the direct back of the mic. Supercardioids thus may be more useful for rejecting sound from a pair of spaced floor-mounted monitor speakers behind the mic, as compared to a cardioid, which would do a better job of rejecting sound from a single floor-mounted monitor directly behind the mic.

University microphones are available in two basic types of directional patterns: omnidirectional and cardioid.



Omnidirectional



Cardioid

Proximity Effect

"Proximity effect" is the term which describes the "bass boost" that is inherent in certain directional microphones *when they are very close to the sound source* (i.e., in close proximity). The two basic types of cardioid mics offered by University are "Single-D" and "Variable-D."

Single-D: This type of cardioid microphone has one rear port (opening) at the back of the diaphragm. At close working distances, the bass frequency response is significantly boosted. One advantage of this proximity effect is the "big bass" sound preferred by many vocalists. However, complementary bass roll-off can be applied with equalization or high-pass filtering to attenuate the proximity effect.

When appropriate bass roll-off is applied with equalization, the resulting output of the mic/EQ system will accurately represent the vocal (or instrumental) input signal at the mic, but more distant, feedback-producing bass energy (which has not had the benefit of the additional proximity-caused bass boost) will be attenuated. Remember that excess bass energy is often present near stage mics because bass frequencies propagate omnidirectionally or nearly so from many cone speakers. Thus, the result of using the proximity effect to "naturally" boost close-up vocal bass, then EQ to reciprocally roll-off the proximity effect, is to further improve gain-before-feedback performance since the "bass spill" is attenuated.

Variable D®: We hold the patent on this exclusive design, which virtually eliminates the proximity effect of cardioid microphones and improves clarity. Variable-D microphones have multiple ports to the rear of the diaphragm, some of which take the form of a long slotted tube. This technique maintains a consistent bass frequency response as the working distance is varied. Thus, the Variable-D microphone provides a more natural sound. Other advantages are reduced breath noise and reduced shock sensitivity.

Electrical Considerations

The microphones listed in this catalog may be low impedance (typically 150 ohm, dual impedance (selectable between high and low), or either high or low impedance (which must be specified). The use of a low-impedance microphone is a necessity for low noise pickup and long cable runs without high-frequency loss. University low-impedance microphones should be used with inputs rated for low-impedance microphones. The actual input impedance of such devices is typically not 150 ohms, but often may range from about 1,000 to 2,000 ohms (sometimes higher). The higher input impedances have little effect on microphone frequency response or distortion.

University low impedance microphones may be modified for use with unbalanced high-impedance inputs by using the 502C or 502CP in-line mic matching transformers.

Microphone output levels should be compatible with the input of the mixer, paging amp, console, recorder, etc. This is usually not difficult since most inputs are designed around the relatively narrow range of output levels available. However, when extremely high or low sound pressure levels are anticipated, the specific microphone output level and the characteristics of the microphone input can be critical if noise, mic overload, or input overdrive are to be avoided.

The output reference for University low-impedance microphones is 0 dB = 1 milliwatt/10 dynes/cm². The output level specification tells how far the output (in dB) is below 1 milliwatt delivered to a load impedance equal to the microphone's internal impedance - with a sound pressure level at the microphone diaphragm of 94 dB SPL (10 dynes/cm²). Measurements are made at 250 Hz in an anechoic chamber (an echo-less environment). The output reference for University high-impedance microphones is 0 dB = 1 volt/dyne/cm².

Mechanical Considerations

University manufactures a full line of microphone accessories. These include mounting hardware, matching transformers, desk stands, and windscreens. See page 11. Descriptions of microphones in this catalog list those accessories which are included with the model. All other accessories must be ordered separately.

Definitions and Other Explanations

In the following pages we describe several types of microphones, including dynamic mics, condenser mics, and differential mics. A dynamic microphone is one which converts acoustical to electrical energy by means of a coil which is attached to the mic diaphragm, and a permanent magnet. The coil moves through the magnetic flux and thereby generates an electric current. A condenser microphone utilizes a capacitor (condenser) as the pickup. In some condenser microphones, a polarizing voltage (from a battery or remote power supply) is applied to one of the two plates in the condenser. In "electret condenser" mics, one of the plates is permanently charged. One of the two plates is driven by the diaphragm (or is the diaphragm), and the changing spacing between the two plates induces a proportional voltage across the condenser. Typically, the condenser mic has a very high output impedance, so an impedance converter is required to drive the cable to the mixing console or recorder. The converter (or preamplifier) is generally built into the mic, and is powered by a small built-in battery, a remote battery, or by "phantom power." Phantom power is a positive DC voltage applied equally across the two signal-carrying conductors of the mic cable; the cable shield is the ground reference. Capacitors at the mic's impedance converter (preamp) block the DC voltage from reaching the mic diaphragm, yet allow the signal to flow. Typical phantom power is 48 volts, although AB powered mics (not sold by University) use a 12 volt supply.

Differential mics use one of two techniques to cancel "noise" (distant sounds): either two adjacent, identical mic elements are wired in reverse polarity, or a one-element mic has a special rear port. Distant sounds tend to drive the two elements (or both sides of the ported diaphragm) equally, thus cancelling, whereas a sound source close to one side of the mic will create differential pressure across the element(s) and will not be cancelled.

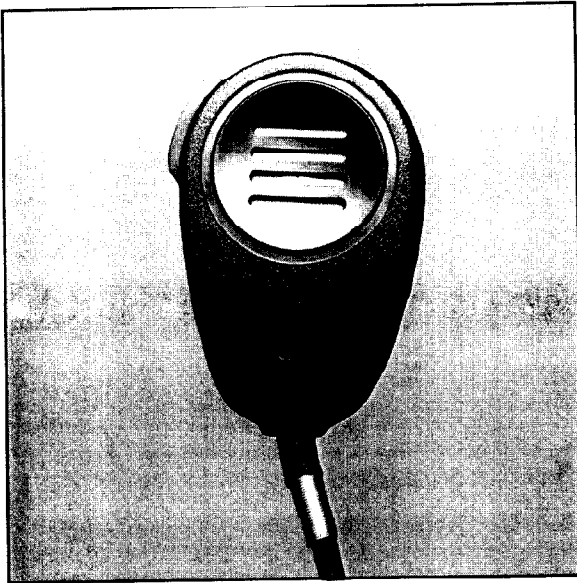
N-DYM is a trademark for Neodymium, a very high energy magnetic material which is used in certain mics to achieve high output and low distortion due to the special microphone geometries it permits us to use.

Acoustalloy® is a proprietary plastic material for microphone diaphragms which our engineers developed to supplant aluminum and like alloys. It can be precisely formed, deformed by momentary high sound pressure levels, it returns to its desired shape. It is very light, providing extended high frequency response, and is immune to corrosion.

Acoustifoam® is a controlled-porosity open-cell foam we developed for use in microphone windscreens. It has no rigid supporting members, and is not set into vibration by normal wind velocities (it removes wind noise above 100 Hz). It is washable and durable.

Communication Microphones

US600EL Hand-Held Mic

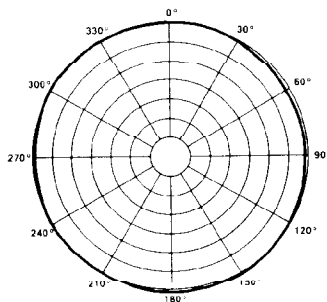
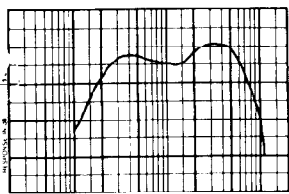


- **Omnidirectional, optimized for paging**
- **Long-life grip-to-talk switch**
- **Withstands environmental extremes**
- **Heavy-duty 6' (1.8m) coil cord**
- **Balanced, low-Z output**

The US600EL is a handheld dynamic microphone designed for clear speech transmission in normal ambient noise levels. Unlike mics designed for maximum noise rejection, the 600EL is able to be used effectively without special "close talking" techniques. Its smooth, tailored frequency response, and high output level make the US600EL an excellent choice for communications applications, including: police, marine, mobile PA and paging.

A non-metallic Acoustalloy® diaphragm and a high-impact molded polycarbonate case enable the US600EL to withstand rough usage, as well as extremes of temperature, high humidity, and the corrosive effects of salt air.

The grip-to-talk switch has a positive detent and a sturdy spring return. This leaf-switch is life tested past 250,000 actuation cycles, and is wired so that it shorts the mic element in "off" position while leaving the line to the amplifier "open" so as not to short out other mics in parallel-wired multiple-mic paging applications. An additional pair of contacts on the grip switch can trip an external relay. The 1.8 meter (6-foot) coiled connection cord is comprised of a two-conductor shielded cable for the mic output, plus another pair of wires for the "spare" switch contacts.



US602FL Hand-Held Mic

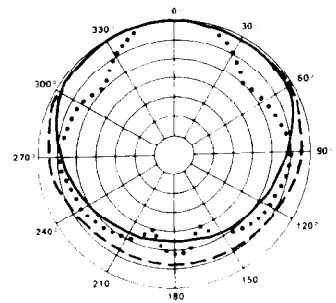
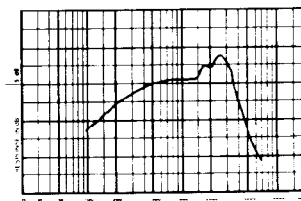


- **Bi-directional, noise-cancelling type**
- **Long-life grip-to-talk switch**
- **Withstands environmental extremes**
- **Heavy-duty 6' (1.8m) coil cord**
- **Balanced, low-Z output**

The US602FL is a handheld, noise-cancelling dynamic microphone designed for clear speech transmission in the midst of high ambient noise levels. Its smooth frequency response, high output level, and stability under environmental extremes make the US602FL an excellent choice for communications applications, including: police, marine, mobile PA and paging.

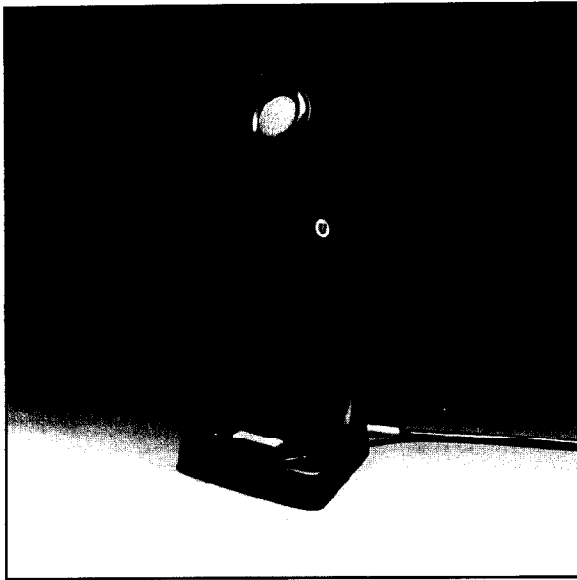
This mic is similar to the US600EL, but offers a high degree of ambient noise rejection. This characteristic is provided by a balanced port which presents unwanted (distant) sound to the rear of the diaphragm in such a way that it is 180° out-of-phase with the same sound reaching the front of the diaphragm.

Like the US600EL, the rugged US602FL has a high-impact polycarbonate case and a non-metallic Acoustalloy® diaphragm which enable it to withstand rough usage, as well as extremes of temperature, high humidity, and the corrosive effects of salt air. The US602FL's frequency range is tailored to give good voice response. It has the same, reliable grip-to-talk switch as the US600EL.



Communication Microphones

US621L & US622L Desk Mics



- **Omnidirectional type (US621L)**
- **Noise-cancelling type (US622L)**
- **Rugged, diecast stand for desk or hand-held use**
- **Convertible grip- or push-to-talk switch**

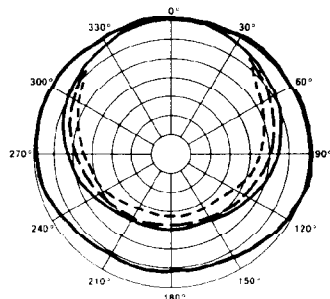
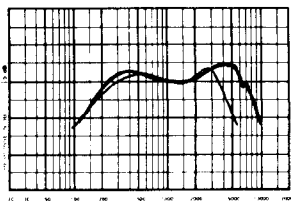
The US621L and US622L are dynamic, low-impedance, balanced-output microphones designed for general communication and paging applications. They stand alone on a desktop, although they also may be configured for hand-held operation. The US621L is an omnidirectional mic with wide frequency range, making a good choice for general-purpose and office paging applications.

The US622L is a noise-cancelling design, with a more restricted frequency range, making it ideal for paging, dispatching and call systems where the ambient noise level is high. The tailored response and noise-cancelling design enable the user to close-talk the mic in a normal voice, without straining to overcome the background noise. This mic is also useful for elimination of feedback in unfavorable acoustic environments.

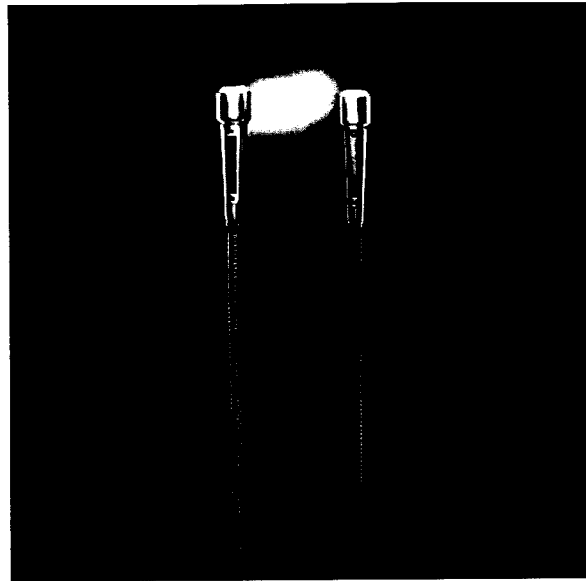
Both models feature a non-metallic Acoustalloy[®] diaphragm, which withstands extremes of temperature, high humidity, and the corrosive effects of salt air.

The mics come with an exceptionally durable and flexible switch mounted in the base of the stand for touch-to-talk operation. The switch is wired so that it shorts the mic element in "off" position; it can be rewired to leave the mic output "open" so that it is compatible with multiple-mic (parallel-wired) paging systems. An additional set of three contacts on the switch are provided for wiring to an external relay. Sliding the switch to one side, after engaging it, locks it on. A setscrew can be adjusted to block the locked-on mode. The switch also may be remounted in the vertical portion of the stand, thus optimizing the mic for grip-to-talk operation. The 7 foot (2 meter) black-PVC-jacketed connection cord is comprised of a two-conductor shielded cable for the mic output, plus an additional three wires for the NC (normally closed) and NO (normally open) switch contacts.

US622L US621L



US637 & US637S Gooseneck Mics

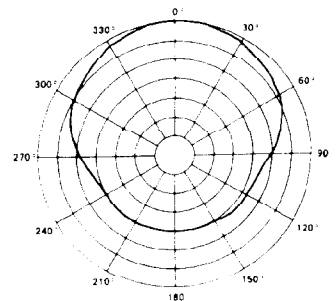
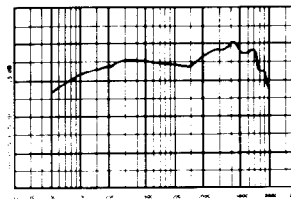


- **Extremely rugged, diecast construction**
- **Long-life grip-to-talk switch (S model)**
- **Field-replaceable mic element**
- **Extra heavy-duty mounting flange**

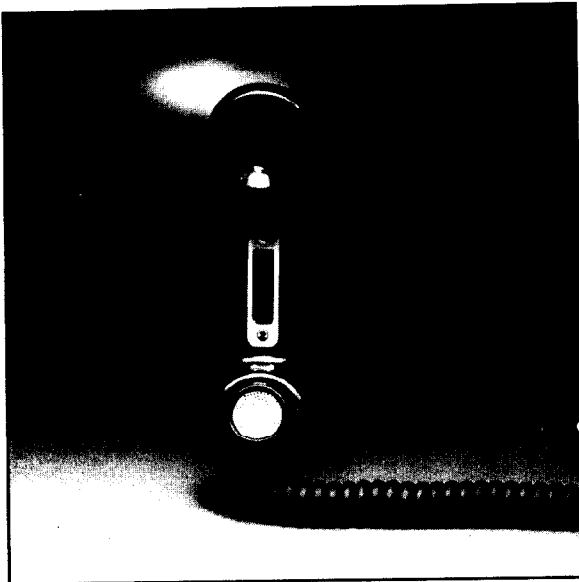
The Models US637 and US637S are durable, shock-mounted gooseneck-supported microphones featuring extended frequency response for intelligibility. They combine attractive styling with ruggedness and high output level. The US637 and US637S are ideally suited for use in drive-up banks, fast-food restaurants, supermarkets, and other commercial applications. The replaceable, dynamic motor element is shock mounted in a diecast metal case. Attached to the metal case is an 18-inch flexible gooseneck terminating in a metal flange for surface mounting. The flange is slotted to provide the option for cable exit above the mounting surface. The microphone can be removed from the gooseneck and mounted on any 5/8"-27 external thread. Sealed to prevent vapor penetration, the US637S also provides a replaceable leaf-type switch designed to operate more than one million cycles. As shipped, the US637 and US637S may be used as direct, bolt-down replacements for most gooseneck mics in paging applications.

The omnidirectional polar characteristic of these microphones, combined with their tailored frequency response, yields excellent voice intelligibility without the low-frequency accentuation and breath pops of a directional mic.

By combining an internal shock-mount with the inherent low shock sensitivity of an omnidirectional design, these microphones greatly reduce mechanically-produced sounds caused by the user grasping and moving the mic head.



US625ST Handset

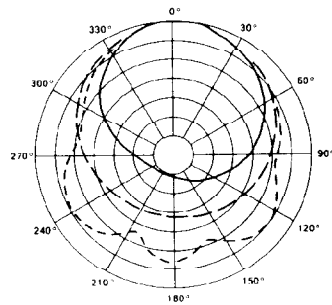
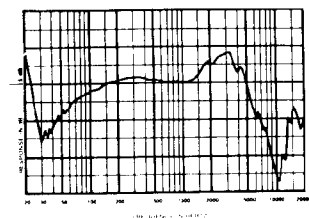


- “Presence peak” for high speech intelligibility
- Noise-cancelling characteristic
- Long-life grip-to-talk switch
- Field-replaceable dynamic element
- Durable case

The Model US625ST is a noise-cancelling handset microphone, designed for high-articulation speech transmission in conditions of high ambient noise. It is the result of continuous study of the needs of the communications industry, and it uniquely meets the specialized requirements of two-way radio and industrial applications. The design effectively rejects noise, while accepting speech which originates immediately next to the diaphragm.

A peak in the 3kHz region enhances “presence” and tends to pull speech “out of the mud.” A low-frequency roll-off attenuates noise in the spectral region below essential voice communication. Coupled with the noise-cancelling characteristic, this response thus provides extremely reliable, crisp, clear speech reproduction with high sensitivity and low distortion.

The grip-to-talk switch is life tested past 250,000 actuation cycles. The switch is wired so that it does not short the mic element in “off” position, but rather completes the circuit when squeezed to turn on the mic. An additional pair of contacts on the grip switch are provided for wiring to an external relay. The 5 foot (1.5 meter) coiled connection cord is comprised of a three conductors for the mic output and earphone input (they share the common connection), plus another pair of wires that enable the “spare” switch contacts to remain independent of the mic output signal for operating an external relay. The mic output is unbalanced and low impedance.



US607L Stud Mount Mic

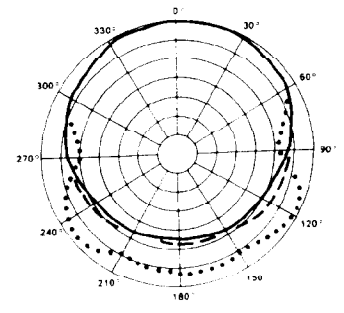
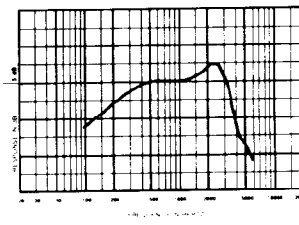


- Differential, noise-cancelling mic
- Withstands environmental extremes
- Integral coupler for mic-stand stud
- Balanced, low-Z

The US607L is a stud-mount type, differential, noise-cancelling dynamic microphone. The differential design exhibits proximity effect (bass boost on nearby sound). For this reason, a bass roll-off is incorporated in the mic, which serves to correct the response for the near field (and close-talking is essential due to the differential nature of the mic), while further attenuating distant, low frequency noise. In addition, a midrange peak is provided for extra presence. The US607L's overall frequency range is band limited to the vocal range (300Hz to 3.8kHz) to further exclude noise. The result is a mic which allows the user to speak closely in a normal voice, while effectively cancelling distant noise. The US607L is thus ideal for public address work, all types of dispatching and call systems, and paging systems.

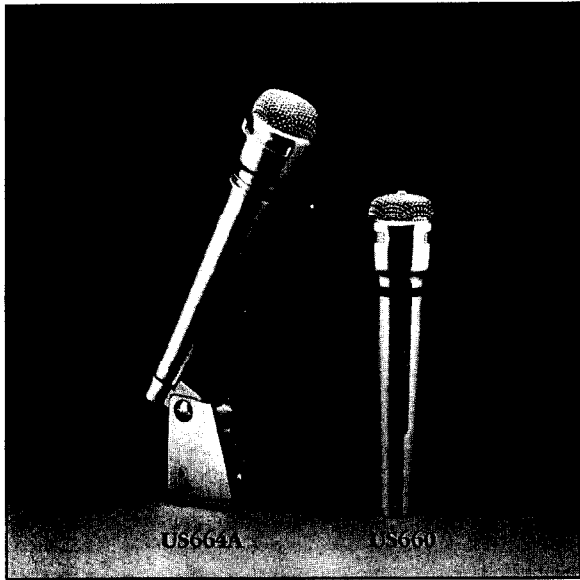
The rugged US607L has a high-impact molded polycarbonate case and a non-metallic Acoustalloy[®] diaphragm which enable it to withstand rough usage, as well as extremes of temperature, high humidity, and the corrosive effects of salt air.

The mounting flange incorporates a 5/8"-2" thread coupler for mounting on the stud of a typical mic stand. The mic head is tilted at a fixed angle of 30°. The output is balanced to ground and low impedance. A 3-pin professional audio connector is recessed in the mounting flange, and accepts a standard XLR-type mic cable.



Cardioid Microphones

US660, US660A, US664A Variable-D Cardioid Dynamic Mics



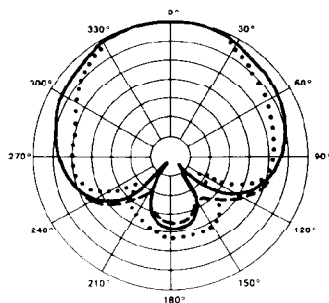
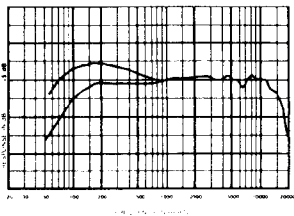
- Supercardioid pattern
- Withstand environmental extremes
- Shock-resistant metal cases
- Balanced, low-Z or unbal., high-Z output
- On/Off switch (US664A)

Because they are supercardioid mics, the US660, US660A and US664A provide maximum rejection at 150° rather than the 180° of a cardioid. This assures greatest rejection in the horizontal plane when the mic is tilted in its most natural position, 30° from the horizontal (as on a desk or floor stand). Normally, directional mics exhibit proximity effect (bass boost on nearby sound). These mics utilize our patented Variable-D[®] technology which permits close-mic use without bass boost.

All three models utilize the mechanical nesting concept of design, providing a nearly solid mechanical structure that is highly resistant to damage from shock. The exclusive non-metallic Acoustalloy[®] diaphragm is virtually unaffected by extremes of temperature or high humidity.

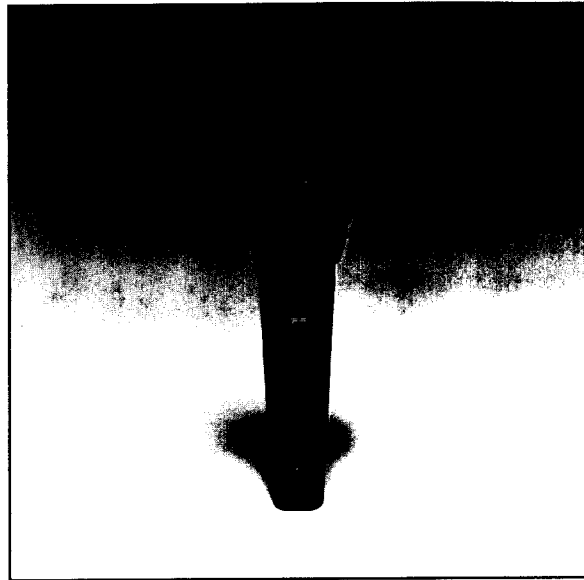
The US660 and US660A come with stand-mount adapters but can be hand-held, whereas the US664A is strictly for stud mount to a mic stand (with $\frac{1}{8}''$ -27 thread). Wide, smooth frequency response make these mics suitable for a variety of vocal or instrumental applications where unidirectional sensitivity and a response characteristic that does not change with distance from the mic are desirable (i.e., where the user moves around a lot and does not exercise careful mic-usage techniques).

The cases are made of pressure-cast zinc. The US660 has a chrome plated finish, whereas the US660A is finished in non-reflecting blue-black. Able to drive nails without functional damage, these mics earned the name "Buchanan hammer." The US660/660A output connector can be field modified to provide a balanced, low-impedance connection or an unbalanced, high-impedance connection. The chrome plated US664A includes a combination on/off switch and impedance selector in its mounting flange.



Single-D Cardioid Microphones

US681L Standard Cardioid Dynamic Mic

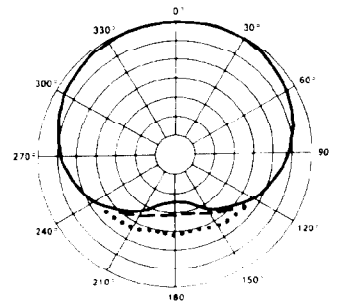
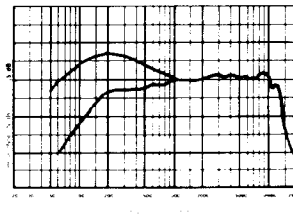


- Single-D cardioid
- Rugged construction
- Built-in Acoustifoam[™] pop filter
- Locking on/off switch

The US681L features high output level along with a smooth frequency response and excellent gain-before-feedback characteristics. Its Single-D cardioid design exhibits the familiar "proximity effect" which emphasizes low frequencies when used close to the sound source. Smooth off-axis response avoids the coloration found in many cardioid mics. Given its wide frequency range, flat far-field response, and unidirectional sensitivity, the US681L is an excellent choice for high-quality instrumental and vocal sound reinforcement, public address, and recording.

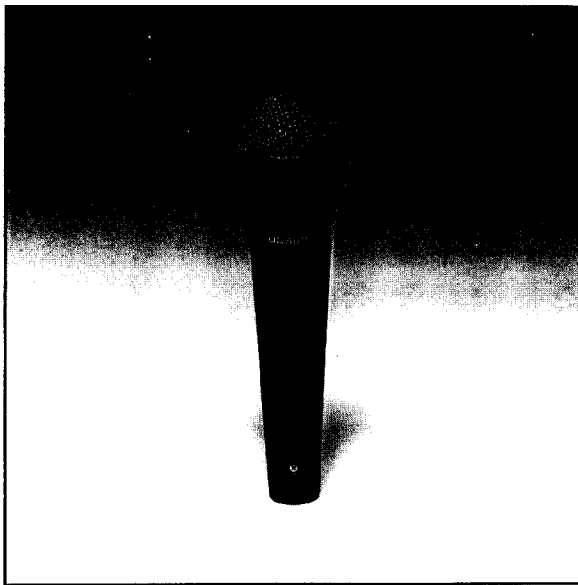
The case is made of pressure-cast zinc and finished in non-reflecting blue-black. A sturdy mechanical structure, along with a highly effective shock absorber (very desirable in a hand-held mic), isolate the transducer assembly from mechanical noises and shock. The exclusive non-metallic Acoustalloy[®] diaphragm is virtually unaffected by extremes of temperature or high humidity. A built-in Acoustifoam[™] blast filter facilitates close talking or singing without concern for "P-popping." The US681L comes with a stand-mount adapter for use with a $\frac{1}{8}''$ -27 stud. The balanced, low impedance output appears on an A3M (XLR-type) connector for use with standard mic cables.

The US681L is equipped with a switch that shorts the mic element when set to the "off" position. The switch enables the mic to be locked in "on" mode for foolproof operation in critical applications where the user would not want to be muted inadvertently, yet the lock is readily defeated so the mic can be switched on and off when the user wishes to have local muting control.



US688L

Standard Cardioid Dynamic Mic



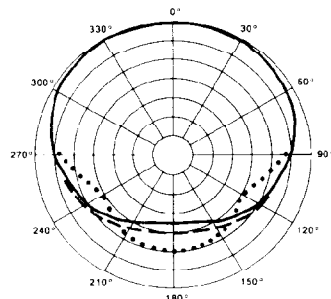
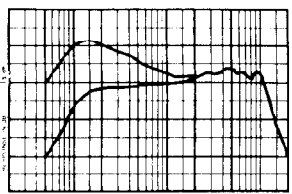
- **Single-D cardioid**
- **Rugged construction**
- **Built-in Acoustifoam™ pop filter**
- **On/off switch**

The US688L is a Single-D cardioid mic featuring high output level, as well as "proximity effect" (which emphasizes low frequencies when used close to the sound source). Given its excellent gain-before-feedback characteristics, the US688L is an ideal mic for use by the vocal entertainer.

Smooth off-axis response avoids the coloration (skewed frequency response) found in many cardioid mics, and also minimizes feedback problems as the performer moves around the stage. So long as the vocalist close-talks the mic, some of the resulting proximity boost may be preserved for a more robust sound, but some or all of that acoustically-created boost may be intentionally rolled-off via electronic equalization in the mixing console; this will enhance intelligibility while attenuating unwanted, feedback-causing, low-frequency background sound.

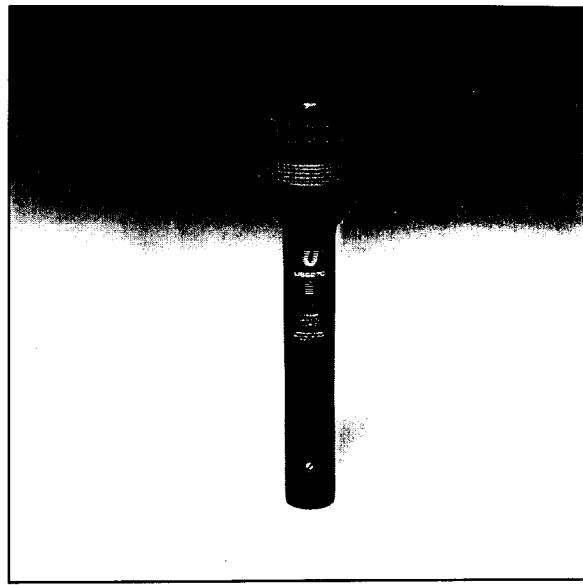
The case is made of pressure-cast zinc and finished in non-reflecting blue-black. A sturdy mechanical structure, along with an effective shock mount, isolate the transducer assembly from handling noises. A built-in Acoustifoam™ blast filter facilitates close talking or singing without concern for "P-popping," and protects the diaphragm from dirt. The US688L comes with a stand-mount adapter for use with a 5/8" - 27 stud. The balanced, low impedance output appears on an A3M (XLR-type) connector for use with standard mic cables.

The US688L is equipped with an on/off switch that shorts the mic element when set to the "off" position, thus minimizing noise in the preamplifier.



US627C

Standard Cardioid Dynamic Mic



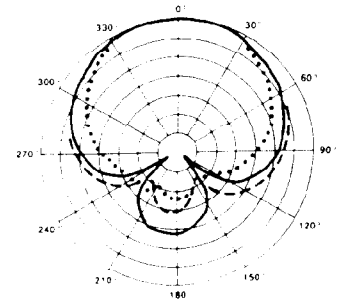
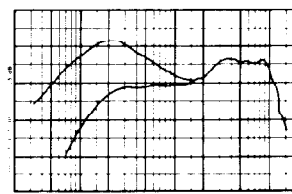
- **Single-D cardioid with proximity boost**
- **Rugged construction**
- **Built-in Acoustifoam™ pop filter**
- **On/off switch**

The US627C is a Single-D cardioid mic featuring high output level, as well as "proximity effect" (which emphasizes low frequencies when used close to the sound source). Given its excellent gain-before-feedback characteristics, the US627C is an ideal mic for use in those sound reinforcement and recording applications where extra bass output is desired for near-field sources.

Like the US688L, the US627C exhibits smooth off-axis response, thus avoiding coloration. Proximity effect may be used to enhance the user's voice, or may be rolled off with an equalizer to improve gain-before-feedback performance.

The case is made of pressure-cast zinc finished in non-reflecting blue-black. A sturdy "nested" mechanical structure, along with a highly effective shock absorber, isolate the transducer assembly from handling noises and shock. The exclusive non-metallic Acoustalloy® diaphragm is virtually unaffected by extremes of temperature or high humidity. A built-in Acoustifoam™ blast filter facilitates close talking or singing without concern for "P-popping" while protecting the diaphragm from dirt. The US627C comes with a stand-mount adapter for use with a 5/8" - 27 stud. The balanced, low impedance output appears on an A3M (XLR-type) connector for use with standard mic cables.

The US627C is equipped with an on/off switch that shorts the mic element when set to the "off" position.



Single-D Cardioid Microphones

US658L & US658H Cardioid Dynamic Mics

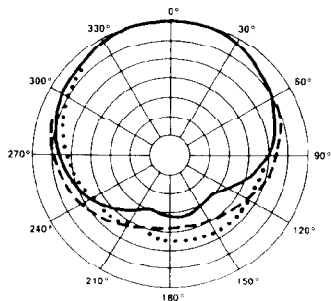
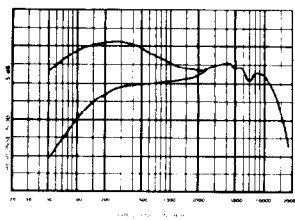


- **Low-Z and high-Z models**
- **Single-D cardioid with proximity boost**
- **Rugged construction**
- **Built-in Acoustifoam™ pop filter**

The US658L (low impedance) and US658H (high impedance) are Single-D cardioid mics featuring high output level, as well as "proximity effect" (which emphasizes low frequencies when used close to the sound source). They are a fine choice for sound reinforcement, public address, and other applications where quality and price are of prime consideration.

The head design provides wide, linear response for effective gain-before-feedback in sound reinforcement applications.

The case is made of pressure-cast zinc and finished in non-reflecting blue-black. An effective shock absorber isolates the transducer assembly from handling noises and shock. The exclusive non-metallic Acoustalloy® diaphragm is virtually unaffected by extremes of temperature or high humidity. A built-in Acoustifoam™ blast filter facilitates close talking or singing without concern for "P-popping," and protects the diaphragm from dirt. Together, these features assure years of trouble-free operation. The US658L and US658H come with a stand-mount adapter for use with a 7/8" - 27 stud. The output of either model appears on an A3M (XLR-type) connector for use with standard mic cables.



US690 & US690F Cardioid Dynamic Gooseneck Mics

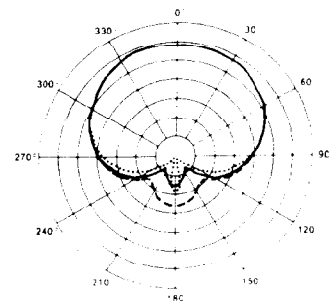
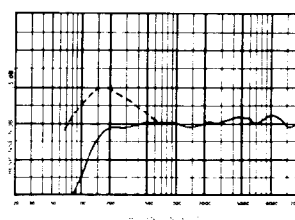


- **N/DYM™ magnetic structure**
- **Cardioid pattern for excellent feedback rejection**
- **Unique shock mount avoids handling noise**
- **Memraflex grille & Acoustifoam™ pop filter**

The US690 (A3 connector, plug-in mount) and US690F (6 foot (1.8 meter) cable, threaded flange mount) are cardioid mics on a 12 inch (30 cm) gooseneck stalk. Both feature our N/DYM (Neodymium) super-strength magnets. Computer optimized design and N/DYM provide up to 6 dB more sensitivity than conventional designs, along with lower peak distortion. An effective hum-bucking coil cancels hum from lighting and other electromagnetic sources. The output is low impedance and balanced (although the US690F may be wired for unbalanced connection).

A unique diaphragm design provides 50% more surface area than conventional designs, and is reinforced to prevent break-up, thus yielding extended high-frequency response with an open, transparent sound quality for greater intelligibility than conventional mics. The uniform cardioid pattern insures superior gain-before-feedback performance.

Both models enclose the transducer in a memraflex grille with Acoustifoam™ pop filter to eliminate explosive breath sounds or wind noise, and protect the diaphragm from dirt. A unique shock mount totally surrounds the mic element, greatly reducing all forms of handling or mechanically-induced noise, making the US690s the mics of choice for ruggedness and performance.



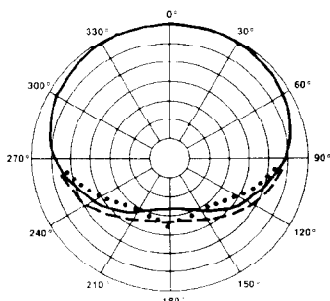
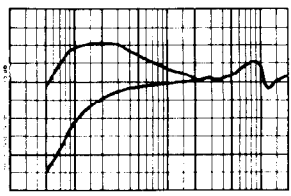
US1772 Cardioid Condenser Mic



- **Single-D cardioid, electret-condenser element**
- **Electronic contour of proximity effect for excellent feedback rejection**
- **24–48V phantom power or internal 4.5V battery**
- **Integral on/off switch**

The US1772 is a Single-D cardioid, low-Z, electret condenser mic for the exacting needs of high-quality sound reinforcement, where maximum gain-before-feedback and fidelity are essential. It may be powered using an internal battery or any "phantom" source from 24V to 48V DC. An on/off switch mutes the mic in either mode and shuts off the battery to conserve its life. An Acoustifoam™ blast filter is integral to the mic and permits close talking without excessive "P-popping." The US1772 has a rugged, die-cast case finished in non-reflecting blue-black. If the mic is dropped, the Memraflex grille screen bounces back to retain its shape.

The mic element is located near the front of the case for highest gain before-feedback. This, along with a very smooth off-axis response and carefully-tailored proximity effect, effectively increase the available gain in the presence of stage monitor speakers and reflective surfaces. Wide frequency response, wide dynamic range, and low distortion ensure a very natural, accurate sound for vocalists and most instrumental sources.



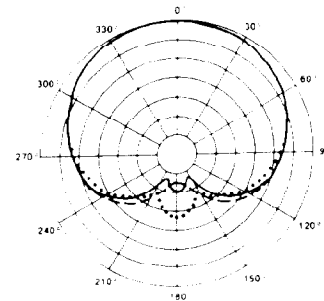
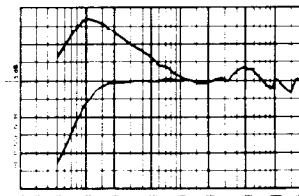
US1 Cardioid Condenser Mic



- **Single-D cardioid, electret-condenser element**
- **Pronounced proximity effect for special effects and/or high feedback rejection**
- **24–48V phantom power or internal 4.5V battery**
- **Integral on/off switch**

The US1 is a Single-D cardioid, low-Z, electret condenser mic with a pronounced proximity effect that yields up to 17 dB of low frequency boost when located 1/4-inch from the sound source. This permits special "deep bass" effects to be achieved. Alternately, when compensated by low-frequency roll-off from an equalizer, proximity effect enables normal response from the nearby sound (voice) while reducing feedback-causing bass energy from more distant loudspeakers. The US1 is a great-sounding, high-quality, directional mic for sound reinforcement, where maximum gain before feedback is essential, as well as for many recording applications.

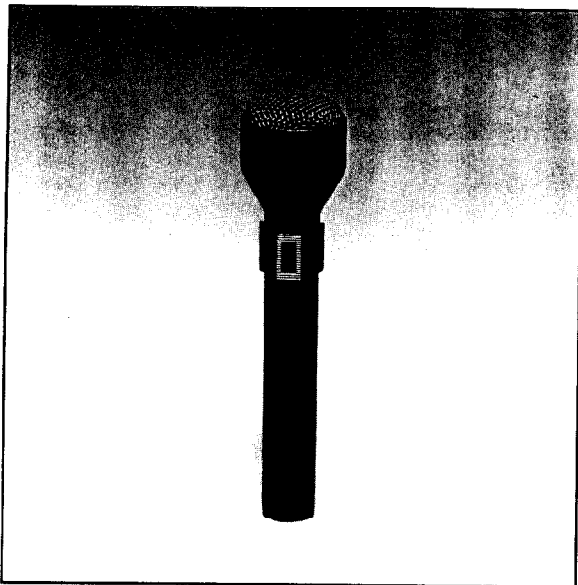
The US1 may be powered using an internal battery or any "phantom" source from 24V to 48V DC. An on/off switch mutes the mic in either mode and shuts off the battery to conserve its life. An Acoustifoam™ blast filter is integral to the mic and permits close talking without excessive "P-popping," while also protecting the diaphragm from dust and magnetic particles. The US1 employs a Memraflex grille screen that, if dropped, bounces back to retain its shape. The mic capsule is shock-mounted in a rugged, die-cast, non-reflecting, blue-black case.



Omnidirectional Microphones

US631B

Omnidirectional Dynamic Mic

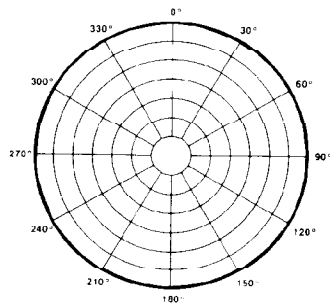
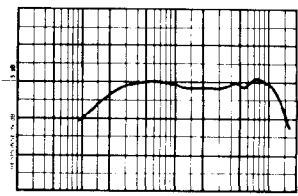


- Omnidirectional, hand-held or stand mount
- For PA & occasional recording use
- Unique removable on-off switch (no tools)
- Withstands environmental extremes
- Balanced, low-Z output

The US631B is a dynamic, omnidirectional, low-impedance mic designed for outstanding performance in demanding public address and non-critical recording applications. Created particularly for close-working, hand-held situations, it is equally effective for musical pickup on a table or floor stand.

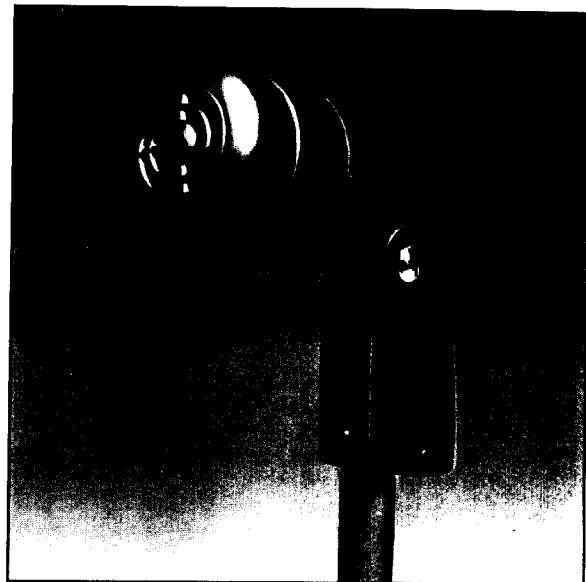
A unique design utilizes a sealed magnetic "on/off" switch inside the mic case. A sliding magnetic actuator outside the case is easily removable without tools — leaving the mic connected in the "on" mode.

The US631B has a rugged, die-cast, non-reflecting, blue-black case. The mic capsule is shock-mounted to dramatically reduce pickup of cable and other mechanical noise. An integral four-stage pop and dust filter ensures freedom from noise generated by the movement of air over the mic surface, and prevents contamination of the diaphragm by dust or magnetic particles. An A3M connector is built in for use with standard mic cables.



US630L

Omnidirectional Dynamic Mic

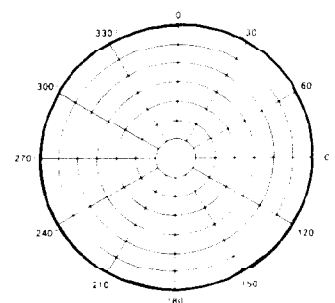
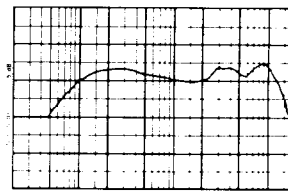


- Omnidirectional, stand mount
- For general PA & broadcast use
- Built-in on-off switch
- Withstands environmental extremes and rough use
- Balanced, low-Z output

The US630L is a dynamic, omnidirectional, low-impedance mic designed for outstanding performance in demanding public address and non-critical recording applications. It is ideal for general PA work in auditoriums, fairgrounds, schools, general communication, and amateur or special radio service.

The US630L may be mounted on a floor or desk stand. The built-in stud mounted stand adapter allows the head to be tilted through a 90° arc. The adapter accepts a 5/8"-27 threaded stud, and includes a shorting-type "on/off" switch.

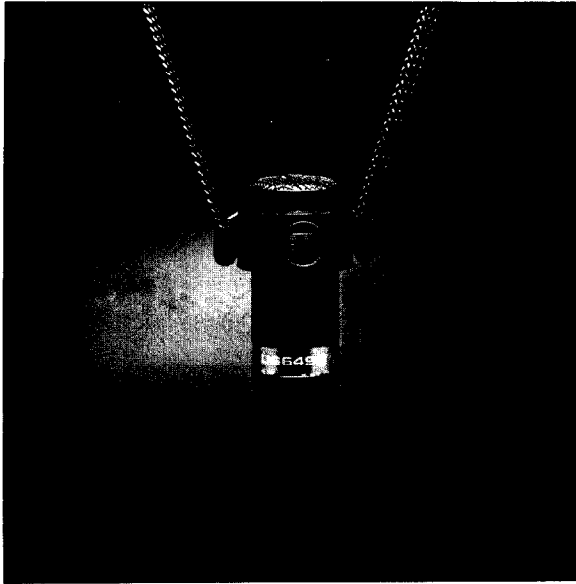
The US630L has a rugged, diecast, non-reflecting, blue-black case. The US630L's exclusive non-metallic Acoustalloy® diaphragm is virtually unaffected by extremes of temperature or high humidity. The US630 is practically indestructible in normal use. An A3M connector is built into the stand adapter for use with standard mic cables.



Microphone Accessories

US649B

Dynamic Lavalier Mic

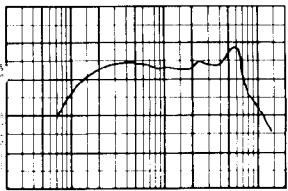


- **Omnidirectional, lavalier style mic**
- **May be handheld, stand mounted, or suspended on neck cord**
Neck cord and belt clip (for cable) included
- **Integral 30-foot, rubber-jacketed cable**
- **Balanced, low-Z output**

The US649B is a small, lightweight, dynamic, low-impedance mic. Its omnidirectional sensitivity, compact size, and light weight (1.1 oz less cable and neck cord), along with a suitable cable and mounting system, make it ideal for public address or recording use, for speeches or lectures, as well as for television applications. The US649B also may be mounted on a stand or handheld.

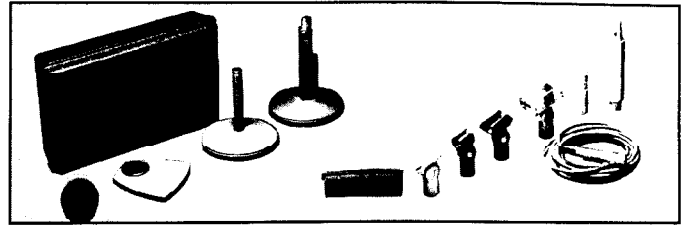
The US649B is finished in non-reflecting, blue-black. The mic cable is thin and jacketed with supple, synthetic rubber for maximum flexibility and minimum handling noise. To further reduce mechanical noise, and hold the cable neatly in place, a clip is provided which secures the cable to the wearer's belt.

The US649B's exclusive non-metallic Acoustalloy® diaphragm is virtually unaffected by extremes of temperature or high humidity.



502C & 502CP

Mic Matching Transformers



- **Match low-Z mics to high-Z inputs**
- **Preserve correct response in the mic**
- **Minimize induced noise**
- **A3F input; MC1M connector output on 502C or 1/4" phone plug output on 502CP**

The Model 502C and 502CP microphone matching transformers are adapters that match low-impedance mics to high-impedance inputs. They are necessary when the mic preamp is designed for high-impedance mics, and a mic must be used more than about 10 feet from the preamp. In this case, if a high-Z mic were used, there would be a high-frequency roll-off (due to the reactance of the cable), and the mic line would be susceptible to induced hum and radio frequency interference. (Just 15 feet of mic cable on a high-Z mic can attenuate sound some 10 dB at 10 kHz.)

Use of a 502, in conjunction with a low-Z, balanced-output microphone, eliminates the problems of high-frequency loss and induced noise. The cable can then be up to 100 feet or longer since it carries a balanced, low-Z signal; the connection between the 502 and the mic preamp should be no more than 3 feet in length.

The 502C and 502CP have A3F inputs to accept a standard 3-pin mic cable. The 502C output is via an MC1M connector (MC1 connectors are found in a number of older PA amps), whereas the 502CP output is via a standard tip sleeve 1/4-inch phone plug. These matching transformer adapters are wired so the tip of the phone plug or the center of the MC1M corresponds with a "hot" signal on pin 2 of the A3 connector; polarity may be reversed to pin 3 "hot" if desired.

Other Mic Accessories

MODEL DESCRIPTION

- 311 3/4" Snap-out clamp, black; polyurethane for quiet, no-mar fit (any 3/4" mic)
- 313A Shock mount for 3/4" diameter microphone; use on stands, podiums, booms, etc.
- 314E Acoustifoam™ windscreen, gray for the US631B; acts as pop filter only (not as a windscreen) when used with the US660 or US664A
- 323 1" Clamp, black (US172, US1)
- 337 Acoustifoam™ windscreen, gray (US627C)
- 340 Security clamp - 3/4" diameter mics; hex-screw lock thwarts theft and vandalism
- 360 Acoustifoam™ windscreen, gray; covers ports & mic head (US660, US660A, US664A)
- 376 Acoustifoam™ windscreen, gray (for the US172, US681, or US658)
- 380 10 dB Attenuator, balanced H-pad for low-Z mics, built into A3M A3F adapter
- 381 On/off switch integral to A3F connector, on 15' mic cable (pigtail, other end)
- 400 Desk stand, gray steel, U-clamp for all mics with switch stud mounts
- 422 Desk stand, gray diecast zinc, for 3/4" or 1" dia. clamp-type mics - low profile
- 423A Desk stand, gray diecast zinc base, 5" steel riser for mics with 5/8"-27 thread
- 428 Touch-to-talk stand, gray; DPDT switch w. lock, 7" high with 5/8"-27 thread
- 456 Single carrying case (universal)
- 458 Zippered, protective vinyl pouch
- 513A 100 Hz high pass filter, A3F in, A3M out, down >10 dB @ 60 Hz, 150Ω nominal
- 521 25' Cable with A3M and A3F connectors (very thin, flexible mic cable)
- 523 4.5V Alkaline battery (US172, US1), 12 per box
- PLC-25X 25' standard microphone cable with A3F & A3M connectors
- PLC-25P 25' microphone cable with A3F connector & 1/4" phone plug
- PLC-100MB 100 meter (328') bulk-roll microphone cable

Microphone Specifications

Specification	Model		
	US1	US600EL	US602FL
Generating Element	Flectret condenser	Dynamic, Acoustalloy [®]	Dynamic, Acoustalloy [†]
Frequency Response*	50 – 18,000 Hz	100 – 7,000 Hz	200 – 5,000 Hz
Polar (sensitivity) Pattern*	Cardioid	Omnidirectional	Bi-directional, pressure gradient
Impedance	150 ohms	150 ohms nominal	150 ohms nominal
Output Level†	-50 dB	-55 dB	-60 dB
Switch	On/Off mutes mic (& turns off Batt)	Shorted in "off" mode	Shorted in "off" mode
Power Supply	24 – +8V phantom or 4.5V battery	N/A	N/A
Current Drain	3.5 milliamps	N/A	N/A
Recommended Batteries	Eveready N ^o 523, Mallory PX21	N/A	N/A
Grille Screen	Memraflex™ w/ Acoustifoam™ filter	Integral to case	Integral to case
Case Material	Die-cast zinc & aluminum	Polycarbonate	Polycarbonate
Finish	Non-reflecting blue/black	Textured black	Gray leather-grain
Mounting	Handheld or stand adapter (incl.)	Hanger button	Hanger button
Connections	A3M recessed in barrel	6', 4-cond. (2 shield) coil cable	6', 4-cond. (2 shield) coil cable
Dimensions (HxWxD or other)	1.97" diameter x 7.50" long (5.0 cm diameter x 19.0 cm long)	3.88" x 2.69" x 1.78" (9.9 x 6.8 x 4.5 cm)	3.88" x 2.69" x 1.78" (9.9 x 6.8 x 4.5 cm)
Net Weight	12 ounces (340 g)	10 ounces (283.5 g), including cable	10.5 ounces (298 g), less cable
Other Data/Notes	Optional battery need not be removed to use with phantom power.	Switch has external relay contacts; dash mounting bracket included.	Switch has external relay contacts; dash mounting bracket included.
	US607L	US621L & US622L	US625ST
Generating Element	Dynamic, Acoustalloy [®]	Dynamic, Acoustalloy [®]	Dynamic mic; magnetic receiver
Frequency Response*	300 – 3,800 Hz	100 Hz–9 kHz (621), 125Hz–5 kHz (622)	50 – 7,000 Hz (mic)
Polar (sensitivity) Pattern*	Noise-cancelling, differential	Omni (621); Cardioid, noise canc. (622)	Noise-cancelling
Impedance	150 ohms nominal	150 ohms nominal	150 ohms nominal (mic or receiver)
Output Level†	-57 dB	-57 dB	-60 dB (150Ω)
Switch	N/A	Shorts or opens in "off" mode	Non-shorting PTT type
Power Supply	N/A	N/A	N/A
Current Drain	N/A	N/A	N/A
Recommended Batteries	N/A	N/A	N/A
Grille Screen	Metal mesh	Metal mesh	Integral to case
Case Material	Lexan [®]	Die-cast zinc & polycarbonate	Polycarbonate
Finish	Blue/black	Blue/black	Black
Mounting	Stud mount via 5/8"–27 coupler	Free-standing or handheld	Handheld or std. handset cradle
Connections	A3M recessed in mounting flange	7', 5-cond. (2 shield) cable	5', 5-cond. unshielded coil cable
Dimensions (HxWxD or other)	4.12" x 1.75" (10.8 x 4.5 x 8.3 cm diameter)	9.69" x 4.5" x 4.81" (24.6 x 11.4 x 12.2 cm)	2.62" x 2.37" x 8.93" (6.7 x 6.0 x 22.7 cm)
Net Weight	12 ounces (340 g), less cable	1 lb, 13 oz (822 g)	14 ounces (397 g)
Other Data/Notes	Head at fixed 30° angle to flange.	Locking switch has ext. relay contacts (normally open & normally closed).	Switch has external relay contacts; dash mounting bracket included.
	US627C	US630L	US631B
Generating Element	Dynamic, Acoustalloy [®]	Dynamic, Acoustalloy [®]	Dynamic, Acoustalloy [†]
Frequency Response*	60 – 13,000 Hz	60 – 12,000 Hz	80 – 13,000 Hz
Polar (sensitivity) Pattern*	Cardioid	Omnidirectional	Omnidirectional
Impedance	150 ohms	150 ohms	150 ohms
Output Level†	-58 dB	-55 dB	-56 dB
Switch	On/Off	On/Off (DPDT, shorted when off)	On/Off; removeable (see below)
Power Supply	N/A	N/A	N/A
Current Drain	N/A	N/A	N/A
Recommended Batteries	N/A	N/A	N/A
Grille Screen	Metal mesh with Acoustifoam™ filter	Integral to case; with magnetic shield	Metal mesh with Acoustifoam™ filter
Case Material	Die-cast zinc	Die-cast zinc	Die-cast zinc
Finish	Non-reflecting blue/black	Non-reflecting blue/black	Non-reflecting blue/black
Mounting	Handheld or stand adapter (incl.)	Flange with 5/8"–27 thread coupler	Handheld or stand adapter (incl.)
Connections	A3M recessed in barrel	A3M in mounting flange	A3M recessed in barrel
Dimensions (HxWxD or other)	2.05" diameter x 7.0" long (5.2 cm diameter x 17.8 cm long)	2" diameter x 6.25" long (5.1 cm diameter x 15.9 cm long)	1.89" diameter x 6.04" long (3.5 cm diameter x 15.3 cm long)
Net Weight	10.4 ounces (295 g)	1 pound (453.5 g)	6 ounces (170 g)
Other Data/Notes		Head swivels 90° vertically.	Removal of switch actuator leaves internal magnetic switch.

† 0 dB reference is 1mV/10dynes/cm² except as otherwise noted. * See graph with mic description. ** 0 dB reference is 1V/dync/cm²

Specification	Model		
	US637 & US637S	US649B	US658L & US658H
Generating Element	M.C. Dynamic, Acoustalloy [®]	Dynamic, Acoustalloy [®] diaphragm	Dynamic, Acoustalloy [®] diaphragm
Frequency Response*	70 – 10,000 Hz	80 – 10,000 Hz	80 – 13,000 Hz
Polar (sensitivity) Pattern*	Omnidirectional	Omnidirectional	Cardioid
Impedance	150 ohms nominal	150 ohms	150Ω (658L) or high-Z (658H)
Output Level†	-62 dB	-61 dB	-61dB (658L); -60 dB (658H) **
Switch	PTT switch on head (637S only)	N/A	On/Off (shorts in "off" mode)
Power Supply	N/A	N/A	N/A
Current Drain	N/A	N/A	N/A
Recommended Batteries	N/A	N/A	N/A
Grille Screen	Metal mesh	Metal mesh	Metal mesh with Acoustifoam™ filter
Case Material	Die-cast zinc	Die-cast zinc	Die-cast zinc
Finish	Chrome-plated	Non-reflecting blue/black	Non-reflecting blue/black
Mounting	5/8"-27 thread or 2-3/4" diameter flange	Lavalier neck cord or handheld	Handheld or stand adapter (incl.)
Connections	6, 4-cond. (2 shield) cable	30', 2-cond. shielded cable attached	A3M recessed in barrel
Dimensions (HxWxD or other)	1.57" diameter x 23.5" long (4.0 cm diameter x 59.7 cm long)	0.75" diameter x 2.25" long (1.9 cm diameter x 5.7 cm long)	2.16" diameter x 6.03" long (5.5 cm diameter x 16.9 cm long)
Net Weight	1 lb, 13 oz (822 g)	1.1 oz (31 g), less cable & neck cord	8.9 ounces (252 g)
Other Data/Notes	Switch wired non shorting; can be rewired to short in "off" mode.	Neck cord assembly and belt-clip to secure cable are included.	US658H output is balanced; can be wired unbalanced for various conn.
	US660 & US660A	US664A	US681L
Generating Element	Dynamic, Acoustalloy [®]	Dynamic, Acoustalloy [®]	Dynamic, Acoustalloy [®]
Frequency Response*	90 – 13,000 Hz	90 – 13,000 Hz	60 Hz – 14 kHz
Polar (sensitivity) Pattern*	Supercardioid	Supercardioid	Cardioid
Impedance	150 ohms (bal) or High-Z (unbal)	150 ohms (bal) or High-Z (unbal)	150 ohms
Output Level†	-56 dB (150Ω) **	-56 dB (150Ω) **	-59.5 dB
Switch	N/A	On/Off function (see below)	On/Off (lockable)
Power Supply	N/A	N/A	N/A
Current Drain	N/A	N/A	N/A
Recommended Batteries	N/A	N/A	N/A
Grille Screen	Metal mesh	Metal mesh	Metal mesh with Acoustifoam™ filter
Case Material	Die-cast zinc	Die-cast zinc	Die-cast zinc
Finish	Chrome (660); Blue/black (660A)	Chrome	Non-reflecting blue/black
Mounting	Handheld or stand adapter (incl.)	Stud	Handheld or optional stand adapter
Connections	A3M recessed in barrel	A3M recessed in barrel	A3M recessed in barrel
Dimensions (HxWxD or other)	1.5" diameter x 6.5" long (3.8 cm diameter x 16.5 cm long)	1.5" diameter x 6.5" long (3.8 cm diameter x 16.5 cm long)	1.9" diameter x 6.19" long (5.0 cm diameter x 15.7 cm long)
Net Weight	10.5 ounces (298 g)	18.5 ounces (524.5 g)	8 ounces (227 g)
Other Data/Notes	A3 connector may be rewired for High-Z, unbalanced output.	Switch can be set to OFF Low-Z ON or OFF/High-Z ON.	Switch shorts mic in "off" mode.
	US690 & US690F	US1772	US688L
Generating Element	N/DYM™ Dynamic, Acoustalloy [®]	Electret condenser	Dynamic, Acoustalloy [®]
Frequency Response*	60 Hz – 20 kHz @ 1/4" (see note below)	50 – 18,000 Hz	60 Hz – 13,000 Hz
Polar (sensitivity) Pattern*	Supercardioid	Cardioid	Cardioid
Impedance	150Ω	150 ohms	150 ohms
Output Level†	-50 dB (658L)	-49 dB	-58 dB
Switch	N/A	On/Off mutes mic (& turns off Batt)	On/Off
Power Supply	N/A	24 – 48V phantom or 4.5V battery	N/A
Current Drain	N/A	3.5 milliamps	N/A
Recommended Batteries	N/A	Eveready N° 523, Mallory PX21	N/A
Grille Screen	Memraflex w/ Acoustifoam™ filter	Memraflex w/ Acoustifoam™ filter	Metal mesh with Acoustifoam™ filter
Case Material	Die-cast zinc	Die-cast zinc & aluminum	Die-cast zinc
Finish	Non-reflecting black	Non-reflecting blue/black	Non-reflecting blue/black
Mounting	See notes below	Handheld or optional stand adapter	Handheld or optional stand adapter
Connections	A3M (690F: 3/4"-16 thread, 1 1/4" flange)	A3M recessed in barrel	A3M recessed in barrel
Dimensions (HxWxD or other)	2.05" diameter x 16.58" long (5.2 cm diameter x 42.1 cm long)	1.90" diameter x 7.95" long (4.8 cm diameter x 20.2 cm long)	2.05" diameter x 7" long (5.2 cm diameter x 17.8 cm long)
Net Weight	17.8 oz / 505 g (690F: 18.4 oz / 289 g)	10.2 ounces (289 g)	0.4 ounces (295 g)
Other Data/Notes	US690, 2' (122 cm) shielded cord; -F, flange removable for 5/8"-27 stud	Optional battery need not be removed to use with phantom power.	Switch shorts mic in "off" mode.

An Introduction to Horns, Drivers & Paging Projectors

The Compression Driver

The loading (pressure) provided by a horn enables the "compression driver" to operate with considerably greater efficiency than a cone-type ("direct radiator") loudspeaker. The driver's small, lightweight, metal diaphragm can be accelerated rapidly enough to reproduce high frequencies without as much distortion as the larger felt or paper diaphragm typical of a direct-radiator. Phenolic-impregnated cloth diaphragms are sometimes used in compression drivers, but these weigh more than their metal counterparts, and are used primarily for sirens or high-power voice paging systems.

The Phasing Plug

In order to maximize efficiency and effectively permit energy originating at the diaphragm to reach the horn throat in-phase, a device called a "phasing plug" is built into the driver. The phasing plug has carefully shaped openings or passages that allow proper channeling of frequencies within the driver's intended range of operation. High-performance, wide-range drivers require more complex phasing plugs which are difficult to manufacture, thereby raising the cost of such drivers.

Measurement of Driver Specifications

A driver's performance is affected by the particular horn with which it is used. Since most drivers can be used with more than one type of horn, it had become an almost impossible task to compare drivers. For this reason, a so-called "plane wave tube" (PWT) was developed as a standard load for a horn. A PWT is a pipe with a fitting for the driver at one end, a cap at the other, some foam inside to dampen standing waves, and a small hole drilled in the pipe to accommodate a precision measurement microphone. PWT specifications for a driver may not relate directly to what you would obtain with a true horn, nor can you use a PWT to do anything other than measure a driver, but the resulting specifications enable drivers to be meaningfully compared.

The power rating of a compression driver is determined by two limitations: thermal (temperature of the voice coil) and mechanical (excursion of the diaphragm). The thermal limitation is independent of frequency; however, the excursion limitation is inversely proportional to frequency. The power rating is typically restricted by the mechanical limitations so a given driver's power rating can be increased if the lower limit of its frequency range is raised.

General Information on Horns

With the increased efficiency of a horn comes increased directivity — a narrowing of the angle over which the sound is radiated. Intentionally narrowed dispersion, particularly if it can be uniform over some band of frequencies, is a benefit in that it enables the system designer to aim sound at the listeners and to keep it out of other areas. Early horns made possible a limited amount of directional control, perhaps covering only midrange frequencies. Today's more complex horns can extend coverage control into the highest audible octave.

Horns are generally rated with horizontal and vertical coverage angles (turn the horn 90° and the coverage angles trade places, obviously). They are also rated with a minimum frequency, below which they either provide little directional control or improper loading of a compression driver. Drivers are often restricted to a lower cutoff frequency which is above the horn's minimum recommended cutoff.

An important specification for the horn is its throat diameter and driver mounting method. Some drivers are threaded to screw into a compatible horn, others use 3 or 4 bolts. These specs will determine whether or not the horn may be used with a particular model of compression driver. Adaptors are avail-

able which permit horns with larger diameter throats to be used with smaller compression drivers, or screw-on drivers to be used with horns requiring a bolt-on driver.

The Simple Sectoral Horn

A simple sectoral horn (or radial horn) has a profile resembling a slice of pie. The angle of the sector approximates the angle of horn coverage in one plane. The side profile of such a horn, however, is not simple but is determined by a mathematical formula which establishes the rate at which the horn flares out from the small end (the throat) to the large end (the mouth). A common formula uses a term with an *exponent*, hence "exponential" horn.

Because the angles of the horn walls change in the vertical plane but not the horizontal, the vertical coverage angle will decrease with frequency whereas the horizontal coverage angle remains somewhat more constant. In a multiple horn driver installation using simple sectoral horns, it is almost impossible to arrange them so that the listeners at the edges of a horn's coverage area hear accurate frequency response. At the same time, simple sectoral horns offer good performance for an attractive price, and are widely used.

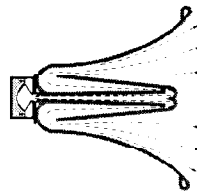
The Folded Horn

The lowest frequency at which a horn is usable is directly related to the mouth size of the horn and the rate of expansion of the cross-sectional area along the acoustic path length; i.e., low frequency horns are large! The folded horn was devised for applications where a long horn won't fit in the available space. This horn curves back on itself so that the overall dimensions are reduced while the internal path length is not. Since the sound must bend around corners, very high frequency performance suffers a bit, but in the speech range (or below) there is no significant performance penalty in a well-designed folded horn. Such horns are more complex, and therefore more costly, to build. The University Cobraflex IIB is a folded sectoral horn in which two cells fold back and join to a single driver. The Cobraflex III is similar, having wider-angle coverage and increased low-frequency efficiency.

The Constant-Directivity Horn

It is possible to achieve more uniform directional control in both the horizontal and vertical planes. A horn which does so is known as Constant-Directivity type, and is really comprised of several dissimilar sections that provide a combination of flare rates. A C-D horn, like the University SM120A, greatly simplifies the job of the sound system designer and can easily save enough time in design and implementation to more than offset its higher initial cost.

A Reentrant Horn



The Reentrant Horn

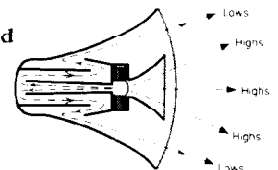
A reentrant horn is a type of folded horn — typically an exponential folded horn with driver. The sound generated by the driver enters a small port in the rear of the horn, and travels through an exponentially-expanding horn which folds back upon itself twice... i.e., the sound re-enters the horn.

Reentrant horns are popular for paging because they are very compact, light, and relatively inexpensive. They are not suited to foreground music because of (usually) limited low-frequency response, and because the high-frequency response is degraded by the many bends in the acoustic path. Some horns have a rectangular cross-section, some are circular

The Paging Projector

Combinations of horns and drivers optimized for voice paging often are known as "paging projectors." Reentrant horns make popular paging projectors, such as the University PA12, PA15, PA30 and PA300 (12, 15, 30, and 60-watt drivers on horns — with various suffix letters to denote the inclusion of a line-matching transformer or a matching transformer). The term "paging projector" may be somewhat of a misnomer for some units, however, such as the University PA30 or the CDPs cited below, which are capable of the wide-range reproduction and relatively low distortion necessary for some foreground and most background music applications.

A Compound Diffraction Projector



The CDP®

The Compound Diffraction Projector (CDP) is a proprietary University design which utilizes a driver with ports on both sides of the diaphragm (hence "compound"). Two horns are connected to one driver, the smaller, straight horn is centered coaxially within a larger, folded horn. This design creates a natural acoustic crossover whereby higher frequencies are projected directly forward through a small, straight horn so they don't have to negotiate any complicated-projecting bends, and lower frequencies are projected by the outer, folded horn. The longer wavelengths of the low frequencies have no trouble negotiating the bends. The smaller, straight horn in the CDP may be rotated 90° to alter the pattern control of high frequencies with respect to lows.

The University FC100 is a "Compound Diffraction Horn" — a CDP without an attached driver. It becomes a CDP when ordered with an attached 30-watt driver (the S3SAT), or 60-watt driver (the S50F). These units have wide frequency response, and are capable of delivering high SPL. CDPs are somewhat more complex and costly than simple reentrant horns, but offer high intelligibility, dramatically improved high-frequency response, extended low-frequency response, low distortion, and better-controlled dispersion.

A Constant Directivity Paging Projector

The University PA430 is a unique product, a 30-watt, constant directivity, reentrant paging projector. As described on the next page, fewer units are needed to cover a given area while avoiding "hot spots" and "dead areas." The result is better sound and lower installed cost than many lower-powered non-constant-directivity systems.

Matching Transformers

A number of University driver and horn models carry a "T" suffix, indicating a matching transformer is incorporated in the product; most of our other drivers can be fitted with an optional accessory transformer. The transformers are made use with 25 volt or 70.7 volt constant voltage distribution systems, and have multiple taps so as to draw different power levels from a given 25V or 70V line. This makes it easy to balance the sound level between different zones of a system where multiple drivers are connected to a single power amplifier's output.

The Benefits of The PA430 Constant Directivity Paging Projector

A description of the University PA430 appears on the following page, along with specifications. On this page, we are providing some additional details about its construction, and why it enables you to design sound systems with more uniform coverage and at potentially lower installed cost than systems employing conventional recessed or sectoral horns.

Constant Directivity – What is it, and Why is it Important?

In conventional direct radiating and horn-type loudspeakers, the dispersion angle of the sound narrows, both horizontally and vertically, as the frequency increases. This is a predictable result of the relationship between the effective diameter of the acoustic radiator (the cone, horn throat, etc.) and the wavelength of the sound. In a "perfect" conventional system, as the wavelength approaches the diameter of the radiator, the sound more closely approaches a straight beam (zero dispersion angle). To avoid ragged, uneven coverage with conventional loudspeakers, and to provide more uniform frequency response at any given listening position, it is generally necessary to (a) use crossovers to divide the audio spectrum into several bands, each of which can be reproduced by a driver whose effective radiating diameter is considerably smaller than the sound's wavelength in that band, and (b) divide the listening area into a lot of zones, each of which is covered by its own loudspeaker system.

It used to be that, in order to provide uniform coverage in the critical speech band, the sound system designer would have to employ far more loudspeakers than were necessary to produce adequate sound pressure levels. Then, the spill of higher frequency (wider dispersed) sound into adjacent loudspeakers' zones would cause excess buildup at these lower frequencies, particularly in the reverberant field, so EQ would have to be applied, which would reduce the available lower frequencies in the direct coverage area of a given loudspeaker. Conversely, at higher (sibilant) frequencies, there would not be adequate coverage near the outer edges of a given loudspeaker's coverage area (unless a lot more speakers were used, each with smaller coverage zones). In any case, with or without EQ, comb filter effects would occur in the overlap areas between loudspeakers, creating uneven response for many listeners.

If a loudspeaker could be designed to provide relatively uniform dispersion throughout its frequency range, then it would not be necessary to further divide the spectrum and cross over to another (smaller radiating diameter) loudspeaker merely to avoid beaming at higher frequencies. Moreover, because the area of uniform spectral coverage could be precisely determined, fewer loudspeakers would be required to assure adequate coverage in the important speech recognition band of 2 kHz to 4 kHz. And there would be no significant areas of overlap in portions of the frequency spectrum, thus avoiding comb filter effects and reducing any requirements for system equalization. Such a loudspeaker has been created, and it is the University PA430 paging projector.

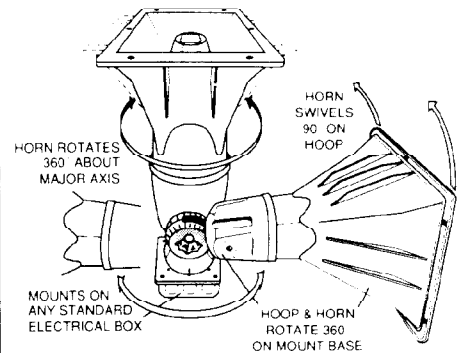
Look at the accompanying illustrations of two paging systems, one with conventional horns, and the other with University PA430s. Notice that with the PA430s, coverage is not only more uniform, but that this is achieved with fewer loudspeakers. In fact, the PA430 has relatively constant directivity from 2 kHz to 10 kHz, which not only covers the speech intelligibility range, but also the higher sibilants and musical harmonics, which makes it suitable for more than just voice paging applications.

Ease of Installation – The PA430's Other Major Advantage

The constant directivity characteristics of the PA430 make it easier to design a sound system, and to specify horn positions and aiming points, than would otherwise be the case. But no matter how carefully any sound system is designed, there will always be a need to empirically determine the best aiming point for each horn at the time of installation. Listening tests and instrumentation will both assist the installers in perfecting the job, and often small adjustments in aiming points can make a big difference.

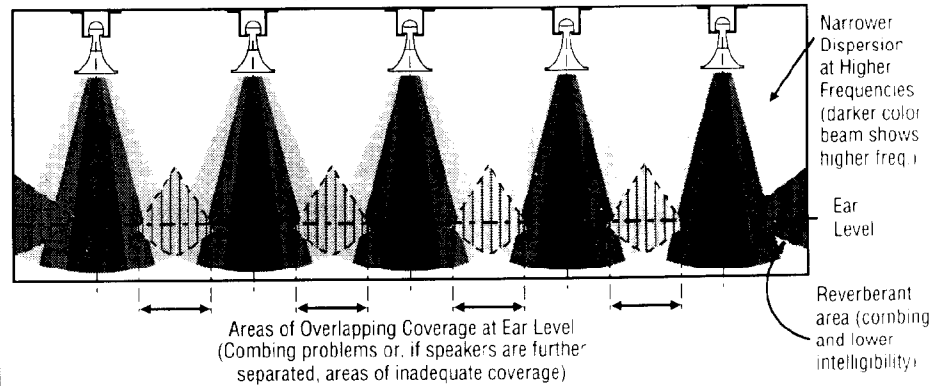
That's why the mounting system of the PA430 was designed to be exceptionally versatile. The base of the horn consists of a 4 inch square flange that can be attached to a standard electrical box with four machine screws. Additional holes in the base are provided so that it can be fixed to a conduit or pipe with U-clamps, and it will accommodate beam clamps or banding mounts. Dual knurled knobs in a unique hoop swivel on the PA430 base enable the installer to adjust the horn position precisely without so much as a screwdriver. The horn itself may be rotated a full 360° about its major axis, the hoop may be rotated 360° at its attach point to the base, and the horn may also be positioned 90° around the hoop. Readjusting the position takes just seconds, and once the exact aim is set, the two knurled knobs securely lock the horn in place. If you've ever toiled with other mounting systems, you'll really appreciate the beauty of the PA430's unique approach.

To facilitate installation and enhance security of connections, the PA430 is equipped with pigtail leads that emerge from the underside of its baseplate. This means that, when the unit is mounted to a standard electrical box, the leads are completely enclosed, thus discouraging casual vandalism or inadvertent damage. Also, because the unit is made of weather resistant materials, no special measures are necessary to avoid rusting or deterioration – whether installed indoors in a moist environment or out of doors. And that translates into faster installation and less maintenance in future years.

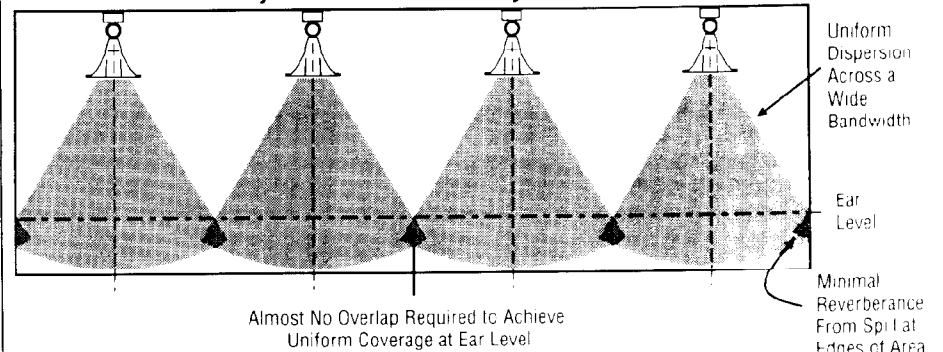


The PA430's Universal Mounting System Facilitates Rapid, Accurate Aiming

Distributed System With Conventional Horns



Distributed System With University PA430 CD Horns

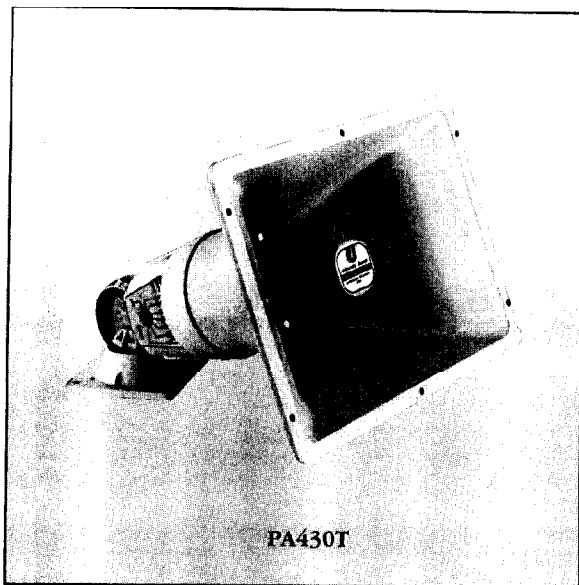


Fewer Horns Are Required, and More Uniform Coverage Achieved, With the PA430. Similar Benefits Are Realized When The Horns Are Clustered From a Single Location.

Paging Projectors

PA430 & PA430T

Constant-Directivity Reentrant Type



- Conservative 30 watt rating
- 60° x 40° coverage from 2 kHz – 10 kHz
- Unique, new, omni-directional swivel mount
- Extended high frequency response

The PA430 is a unique 30-watt, reentrant paging projector which exhibits constant directivity from 2 kHz through 10 kHz, the critical range for good speech articulation. This uniform coverage permits fewer horns to cover a given area, while avoiding "hot spots" and "dead areas." The result is better sound and lower installed cost than many 15-watt systems.

In order to make sure high frequencies reach the horn mouth, a new double-slit phasing plug was developed, utilizing technology from high-performance compression drivers. The diaphragm/voice coil assembly is field replaceable using only a nutdriver.

To make installation easier and more precise than ever, we developed a special new mounting base: a square plate mounts on a standard electrical junction box (as well as U-clamps, beam clamps or banding mounts). The horn/driver assembly is fixed to the base with a swivel system consisting of a hoop and two large, hand-tightened nuts. When the base nut is loosened, the hoop can be rotated 360° about the base. Loosening a nut on the horn/driver assembly permits it to be moved 90° along the hoop and rotated 360° about its major axis. All horn and mounting parts are made of weather-resistant materials. Input wiring exits through the mounting base, after passing through a protective shroud; if an electrical box is used, the system is inherently secure against vandalism.

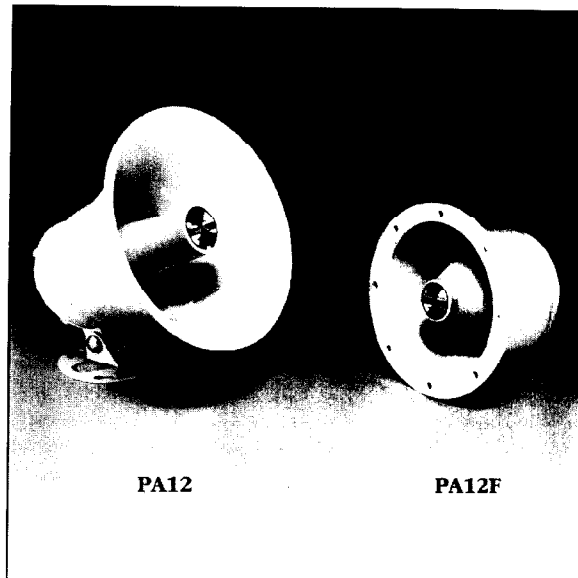
The PA430T has an input transformer to match 25V, 70.7 or 100V lines, with screw-driver-adjustable power taps, built into the rear housing.

PA430 SPECIFICATIONS

Frequency Response	400 Hz – 6.5 kHz, ± 6 dB; 350 Hz lower useable limit
Power Handling	30 watts (500 Hz – 5 kHz pink noise)
Sensitivity	107 dB SPL, 1W, 1m, 500 Hz – 5 kHz pink noise
Impedance	8 Ω nominal (PA430); 5-way power selector (PA430T)
Beamwidth	60° H ($\pm 20^\circ$); -6 dB points 1 kHz through 10 kHz; 40° V (+20°, -10°); -6 dB points 2 kHz through 10 kHz
Directivity Factor 30(Q)	15.2 @ 2 kHz
Voice Coil Diameter	1.5" (3.81 cm)
Dimensions (H x W x D)	8.9" (22.6 cm) x 12.1" (30.7 cm) x 12.2" (31.0 cm) for PA430 or 14.1" (35.8 cm) for PA430T
Net Weight	3.0 lb (1.4 kg) for PA430; 3.8 lb (1.7 kg) for PA430T
Shipping Weight	3.8 lb (1.7 kg) for PA430; 4.6 lb (2.1 kg) for PA430T

PA12 & PA12F

Reentrant Type



- Conservative 12 watt ratings
- Response 850 Hz – 8,000 Hz ± 5 dB (PA12); 700 Hz – 10,500 Hz ± 5 dB (PA12F)
- Versatile, low-cost, for indoor/outdoor use
- Flush-mounting capability (PA12F)

The PA12 is a conservatively rated 12-watt reentrant paging projector for use in any public address or paging application. The standard model includes a sturdy, integral steel swivel-bracket that is positive-locking and painted to avoid corrosion, whereas the "F" version is a variant with a die-cast outer housing incorporating a flush-mounting flange.

The drivers employ a phenolic diaphragm, 1-inch diameter voice coil and "rim-centered" ferrite magnetic structure for long life and reliability under extreme operating conditions. The powerful magnetic structure contributes to a high input sensitivity, thus minimizing the number of drivers (and the size of the power amplifier) needed for a given job.

The PA12 horn is injection-molded, high-impact polypropylene with an ultraviolet light-inhibiting mesa tan finish to avoid deterioration in direct sun. The PA12F outer horn is die-cast zinc, with all components fully moisture- and fungus-proofed.

The PA12 horns have an extended frequency range, resulting in outstanding speech intelligibility and articulation. Because the horns are round, horizontal and vertical dispersion are symmetrical, measuring 75° at 2 kHz for the PA12, and 125° for the PA12F.

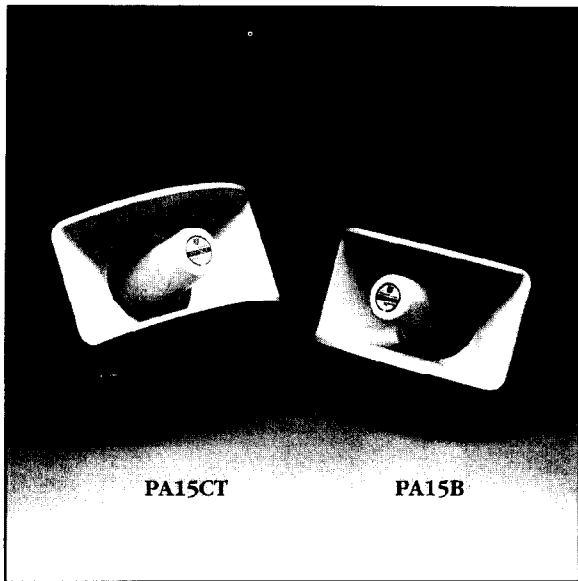
The PA12/12F's nominal 8 ohm impedance allows it to be connected directly to most standard power amplifiers. It is equipped with a switch PVC-jacketed cable, polarity coded and color coded, for simplified connection to a terminal block or to an optional line-matching transformer for 25 or 70.7 volt constant voltage distribution.*

*Constant voltage (CV) distribution is further explained on page 20.

PA12 & PA12F SPECIFICATIONS

Frequency Response	700 Hz – 10.5 kHz, ± 5 dB; 500 Hz lower useable limit
Power Handling	12 watts (500 Hz – 5 kHz pink noise)
Sensitivity (dB SPL)	110 (PA12); 108 (PA12F); 1W, 1m, 1 kHz – 5 kHz pink noise
Impedance	8 Ω nominal
Beamwidth	75° H x 75° V @ 2 kHz
Directivity Factor 30(Q)	12.0 (PA12); 5.0 (PA12F) @ 2 kHz
Voice Coil Diameter	1.0" (2.54 cm)
Dimensions (H x W x D)	7.5" (19.0 cm) x 7.1" (18.0 cm) x 7.5" (19.0 cm)
Net Weight	PA12: 2.2 lb (1.0 kg); PA12F: 3.0 lb (1.4 kg)
Shipping Weight	PA12: 2.5 lb (1.1 kg); PA12F: 3.3 lb (1.5 kg)

PA15B & PA15CT Reentrant Type



- Conservative 15 watt ratings
- Response 550 Hz – 6,500 Hz ± 5 dB
- Durable ABS horn & diecast zinc mount
- CV transformer built-in (PA15CT)

The PA15B and PA15CT are conservatively rated 15-watt reentrant paging projectors for use in any indoor or outdoor public address or paging application where reliability and durability are important.

The PA15CT driver employs a 1.5-inch diameter voice coil and "rim-centered" ferrite magnetic structure for long life and reliability under extreme operating conditions. The powerful magnetic structure contributes to a high input sensitivity (107 dB/W/m), thus minimizing the number of drivers (and power amplifiers) needed for a given job.

The PA15 horn is constructed of high-impact ABS (acrylonitrile butadiene styrene) with an ultraviolet-inhibiting mesa tan finish to avoid deterioration, even in direct sun. The mounting system is unique in that a single wing-nut secures a two-axis diecast-zinc swivel for maximum flexibility and ease of installation.

The extended frequency range of these units results in outstanding speech intelligibility and articulation. Beamwidth is 110°H x 80°V at 2 kHz; horizontal coverage is held constant at 80° from 1 kHz to 5 kHz. Minimum useable frequency is 400 Hz.

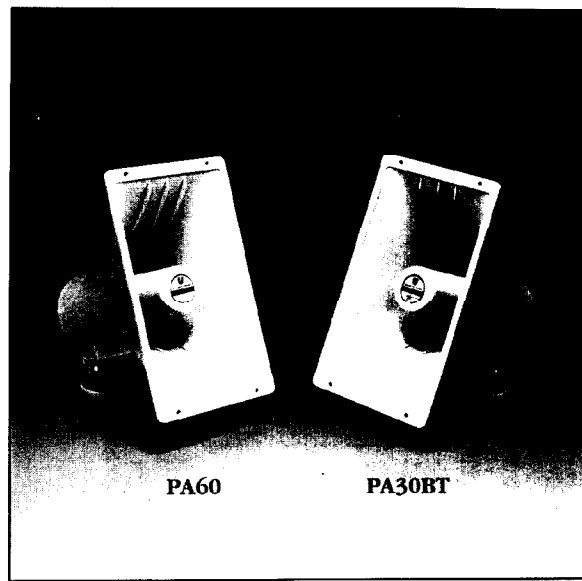
The nominal 8-ohm PA15B is equipped with a 6-inch PVC jacketed cable, polarity coded and color coded, for simplified connection to a terminal block or optional transformer for CV distribution.* The PA15CT includes a transformer (with screwdriver-selectable power taps) within the rear housing.

*Constant voltage (CV) distribution is further explained on page 20.

PA15B & PA15CT SPECIFICATIONS

Frequency Response	550 – 6.5 kHz ± 5 dB; 400 Hz lower useable limit
Power Handling	15 watts (500 Hz – 5 kHz pink noise)
Sensitivity	107 dB SPL, 1W, 1m (500 – 5 kHz pink noise)
Impedance (PA15B)	8 Ω nominal
Beamwidth	80° H x 110° V @ 2 kHz
Directivity Factor (RoQ)	8.4 @ 2 kHz
Voice Coil Diameter	1.5" (3.81 cm)
Dimensions (H x W x D)	PA15B: 7.0" (17.8 cm) x 10.7" (27.2 cm) x 9.1" (23.2 cm) PA15CT: 6.1" (15.6 cm) x 10.7" (27.2 cm) x 11.4" (28.9 cm)
Net Weight	PA15B: 1.2 lb (1.9 kg) PA15CT: 5.5 lb (2.5 kg)
Shipping Weight	PA15B: 1.8 lb (2.2 kg) PA15CT: 6.2 lb (2.8 kg)

PA30A, PA30AM, PA30BT, PA60 & PA60M Reentrant Type



- Conservative 30 and 60 watt ratings
- Response 600 Hz – 6,500 Hz ± 5 dB
- Durable ABS horn & diecast zinc mount
- Fire-protective, UL-listed version (PA30BT)
- Special marine versions (-M suffix)

These 5 paging projectors all share similar construction, differing primarily in finish, power rating, and input connections. The drivers employ rugged phenolic diaphragms with the 60-watt units including PROTEFX™ Teflon-based coatings on the magnetic structure to avoid short-circuiting and reduce heat-producing friction under extreme input conditions.

On-axis sensitivity is conservatively rated over a broad band, and therefore is not directly comparable to most other manufacturers' units which are rated based on peak sensitivity.

The mounting system is unique in that a single wing-nut secures a two-axis swivel for maximum flexibility and ease of installation. These units are suitable for indoor or outdoor use, including mobile installations. The -M versions are specifically designed for harsh marine environments, and include stainless steel hardware and a special molded-in weatherproof finish. The horns are made of high-impact ABS (acrylonitrile butadiene styrene) with an ultraviolet-inhibiting finish to eliminate corrosion or deterioration, even in direct sun. Standard models are mesa tan color, while marine (-M) models are white.

An optional input transformer for 25V or 70V distributed systems can be added to all models, but the PA30BT already includes a transformer (with screwdriver-selectable power taps) within the rear housing.

*Patent pending on PROTEFX™ Teflon is a registered trademark of DuPont™.

PA30 SERIES & PA60 SERIES SPECIFICATIONS

Frequency Response	600 – 6.5 kHz ± 5 dB; 400 Hz lower useable limit
Power Handling	PA30 Series: 30 watts (500 – 5 kHz pink noise) PA60 Series: 60 watts (500 – 5 kHz pink noise)
Sensitivity	117 dB SPL, 1W, 1m (500 – 5 kHz pink noise)
Impedance	8 Ω nominal
Beamwidth	80° H x 50° V @ 2 kHz
Directivity Factor (RoQ)	7.5 @ 2 kHz
Voice Coil Diameter	1.5" (3.81 cm)
Dimensions (H x W x D)	PA30-BT: 11.0" (28.0 cm) x 5.1" (13.0 cm) x 11.4" (29.0 cm) Others: 11.0" (28.0 cm) x 6.5" (16.5 cm) x 8.5" (21.6 cm)
Net Weight	PA30-BT: 5.5 lb (2.5 kg) Other Models: 1.1 lb (2.8 kg)
Shipping Weight	PA30-BT: 5.8 lb (2.6 kg) Other Models: 1.4 lb (3.2 kg)

Paging Projectors

PA34T

Bi-Directional Reentrant Type



- Conservative 30 watt rating
- Response 850 Hz – 8,000 Hz ± 5 dB
- Dual projectors for up to 360° coverage
- Transformer with switchable taps built-in

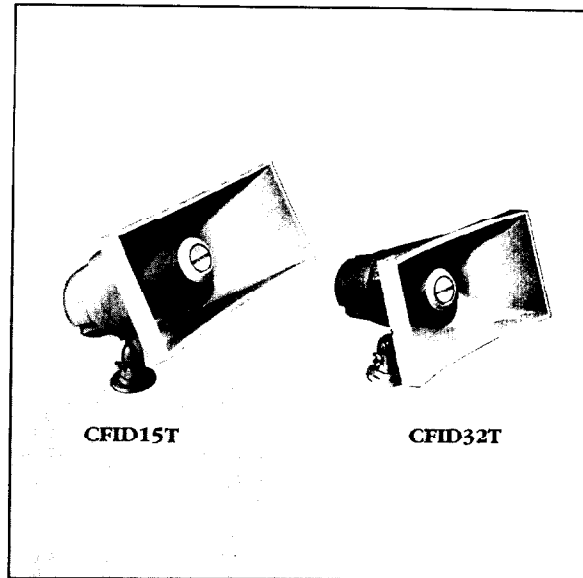
The PA34T is a conservatively rated 30-watt bi-directional reentrant paging projector designed for indoor or outdoor applications, especially long, narrow areas such as hallways. Its dual drivers employ phenolic diaphragms, 1-inch diameter voice coils and "rim-centered" ferrite magnetic structures for long life and reliability under extreme operating conditions.

The PA34T horns are constructed of high-impact polypropylene with an ultraviolet-inhibiting mesh tan finish to avoid deterioration, even in direct sun. The die-cast zinc mounting base houses a 25V/70V matching transformer and a screwdriver-operated power tap select switch. Because each horn is round, its dispersion is symmetrical (75° at 2 kHz, and 180° at 800 Hz – the heart of the speech frequency range). Single wing-nuts secure each horn to the common steel mounting strap, permitting up to 360° coverage with proper aiming adjustment.

PA34T SPECIFICATIONS

Frequency Response	850 Hz – 8 kHz, ± 5 dB; 500 Hz lower useable limit
Power Handling	30 watts (500 Hz – 5 kHz pink noise)
Sensitivity	103 dB SPL, 1W, 1m, (800 – 5 kHz peak noise); 1 projector
Transformer Taps (Watts)	30 ^W , 15 ^W , 7.5 ^W , 3.7 ^W , 1.9 ^W , .8 ^W , .5 ^W , .2 ^W (70V only; 125V only)
Beamwidth	75° symmetrical, each projector, @ 2 kHz
Directivity Factor Ro(Q)	12.6 @ 2 kHz
Voice Coil Diameter	1.0" (2.54 cm)
Dimensions (H x W x D)	8.8" (22.2cm) x 16.5" (41.9cm) x 7.5" (19.0cm)
Net Weight	4.6 lb (2.0 kg)
Shipping Weight	5.1 lb (2.3 kg)

CFID15-8, CFID15T, CFID32-8 & CFID32T Reentrant Paging/Talkback Type



- Diffraction effect for wide horizontal dispersion (55° or 85° at 2 kHz)
- Wide frequency response, variable power
- Uni-lok swivel base & flush mountable
- Weather sealed gland-nut connection
- Transformer built-in (CFID15T & 32T)

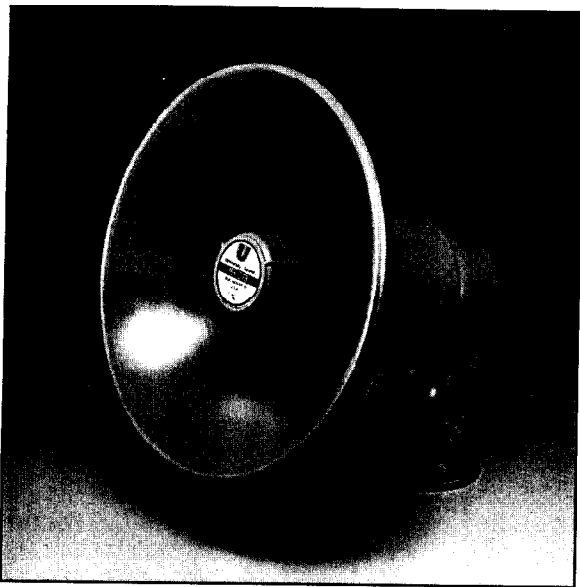
The CFID15-8 and CFID15T are conservatively rated 15- and 32-watt reentrant paging projectors optimized for public address or paging where high speech intelligibility is required under adverse ambient noise (and atmospheric) conditions. They also serve as sensitive talkback speakers for 2-way paging systems.

The unique shape of the reflex, exponential horn increases horizontal dispersion at higher frequencies, by means of a diffraction effect, while also retaining the full mouth area which is necessary for good low-frequency reproduction. The horns are constructed of Cyclocel[®], a non-resonant material that eliminates the "tinny" sound of many metal horns, while resisting severe environments. Their low distortion, and extended low and high frequency response, make the CFID15s and CFID32s a good choice for background music in indoor or outdoor applications.

The CFID15-8 and CFID32-8 have a nominal 8 ohm impedance, while the CFID15T and CFID32T have built-in line-matching transformers for 25 or 70 volt systems, the weather-protected transformers have a screwdriver-selectable power taps. All models use the exclusive Uni-Lok swivel mount for precise positioning. They come with a sturdy bolt-on mounting plate, or may be fitted on any standard 1/2" pipe. Flush mounting at the horn mouth is also possible. The phenolic diaphragm/voice coil assemblies are field replaceable.

SPECIFICATIONS	CFID15 Series	CFID32 Series
Frequency Response	500 Hz – 8 kHz, ± 5 dB	850 Hz – 8 kHz, ± 5 dB
Power Handling	15 watts (500 Hz – 5 kHz)	32 watts (500 Hz – 5 kHz)
Sensitivity	107 dB SPL, 1W, 1m	107 dB SPL, 1W, 1m
Impedance	8 Ω nominal for -8 models; 25 or 70V NMT for -T models	25 or 70V NMT for -T models
Beamwidth	55° @ 2 kHz	55° @ 2 kHz
Directivity Factor Ro(Q)	9.7 @ 2 kHz	10.8 @ 2 kHz
Sensitivity as Microphone	-28 dBm	-28 dBm, Ref. 2" (50.8mm)
Dimensions (H x W x D)	6.8" x 11" x 3.1" (17.1 x 27.9 x 7.9 cm)	7.1" x 11" x 3.1" (18.0 x 27.9 x 7.9 cm)
Net Weight	CFID15-8: 8.0 lb (3.6 kg) CFID15T: 8.5 lb (3.8 kg)	CFID32-8: 8.5 lb (3.8 kg) CFID32T: 8.5 lb (3.8 kg)
Optional Accessory	N/A	CFID32T-1: Uni-Lok Swivel Mount

IBC8 Reentrant Paging/Talkback Type



- Conservative 30 watt rating
- Response 650 Hz – 6,000 Hz ± 5 dB
- Nominal 105° dispersion (1.5 – 3 kHz)
- Spun aluminum bell; baked-on finish
- Made for indoor and outdoor use

The IBC8 is a conservatively rated 30-watt reentrant paging projector talkback speaker for use where high speech intelligibility is required under adverse ambient conditions.

The IBC8 horn is constructed of heavy-gauge spun aluminum, formed in a round, reflex, exponential shape. It has a baked-on, gun-metal-gray acrylic finish. The horn provides control of the built-in driver down to 250 Hz (and output up to 13 kHz). Optimum results are obtained when the unit is used in the 600 Hz to 6 kHz region.

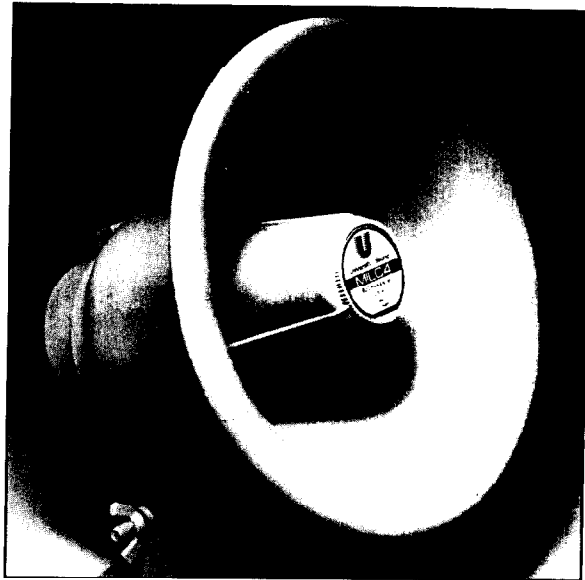
The driver features a phenolic diaphragm/polyamide voice coil former assembly that provides long life with high peak and average input levels. The diaphragm/voice coil assembly is replaceable in the event that an electronic failure or severe abuse causes damage.

The unit has a Uni-Lok bracket — a wing-nut-lockable surface-mount base, adjustable over a range of 90° vertical and 360° horizontal. Low distortion, high sensitivity, smooth coverage of the primary speech spectrum, and a sensitive "mic" function in talkback mode make the IBC8 a good choice for 2-way paging systems.

IBC8 SPECIFICATIONS

Frequency Response	600 – 6.5 kHz, ± 5 dB; 250 Hz lower useable limit
Power Handling	30 watts (500 – 5 kHz pink noise)
Sensitivity	107 dB SPL, 1W, 1m (500 – 3 kHz pink noise)
Impedance	8 Ω nominal
Beamwidth	105° symmetrical (average, 1.5 – 3 kHz pink noise)
Voice Coil Diameter	1.0" (2.54 cm)
Sensitivity as Microphone	-26 dBm (ref: 10 dynes/cm ²)
Dimensions	10 1/4" (26.0 cm) diameter x 9" (22.9 cm) deep
Shipping Weight	4 1/2 lb (2.0 kg)
Replacement Diaphragm	Part No. 445

MILC-4 & MILC-8 Reentrant Paging/Talkback Type



- 10 watt rating
- Response 950 Hz – 4,500 Hz ± 5 dB
- Nominal 120° dispersion (1.5 – 3 kHz)
- Spun aluminum bell; baked-on finish
- Made for indoor and outdoor use

The MILC-4 & MILC-8 are 10-watt, 4 Ω and 8 Ω (respectively) reentrant paging projector talkback speakers for use in areas with moderate SPL requirements.

The horn in these units is constructed of heavy-gauge spun aluminum, formed in a round, reflex, exponential shape. It has a baked-on, gun-metal-gray acrylic finish. The horn provides control of the built-in driver down to 350 Hz (and output up to 13 kHz). Optimum results are obtained when the unit is used in the 500 Hz to 6 kHz region.

The driver features a phenolic diaphragm/polyamide voice coil former that provides long life and weather resistance. The diaphragm/voice coil assembly is replaceable in the event that an electronic failure or severe abuse causes damage.

The unit has a Uni-Lok bracket — a wing-nut-lockable surface-mount base, adjustable over a range of 90° vertical and 360° horizontal. Low distortion, high sensitivity, smooth coverage of the primary speech spectrum, and a sensitive "mic" function in talkback mode make the MILC-4 or MILC-8 a good choice for 2-way paging systems.

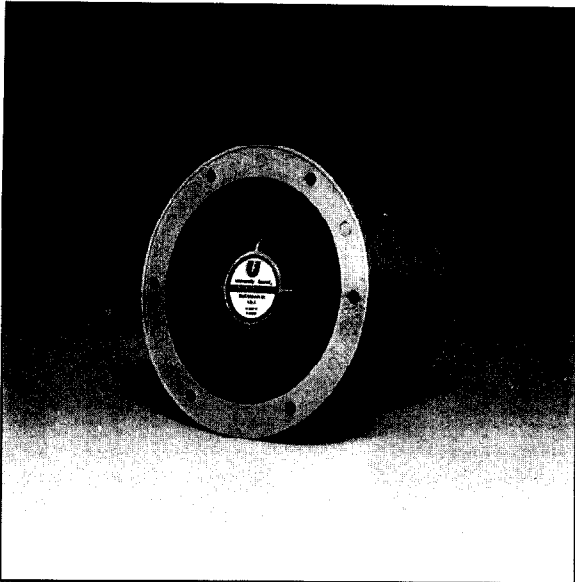
MILC-4 & MILC-8 SPECIFICATIONS

Frequency Response	950 Hz – 4.5 kHz, ± 5 dB; 350 Hz lower useable limit
Power Handling	10 watts (750 Hz – 5 kHz pink noise)
Sensitivity	107 dB SPL, 1W, 1m (750 Hz – 3 kHz pink noise)
Impedance	4 Ω nominal MILC-4, 8 Ω nominal MILC-8
Beamwidth	120° symmetrical (average, 1.5 kHz – 3 kHz pink noise)
Directivity Factor (0/0)	12.2 @ 2 kHz
Voice Coil Diameter	1.0" (2.54 cm)
Sensitivity as Microphone	-26 dBm (ref: 10 dynes/cm ²)
Dimensions	7.8" (19.9 cm) diameter x 9" (22.9 cm) deep
Shipping Weight	2.8 lb (1.2 kg)
Replacement Diaphragm	MILC-4: Part No. 425 MILC-8: Part No. 427

Paging Projector

MIS8C

Reentrant Paging/Talkback Type



- 10 Watt rating
- Response 600 Hz – 7,000 Hz ± 6 dB
- Nominal 153° dispersion (2 kHz)
- Compact, flush-mount design

The MIS8C is a specially designed paging and general communications projector that is designed for flange or flush mounting in cabinets, walls, vehicle dashboards, and similar locations where appearance is a consideration – or where damage is likely to occur to protruding objects. With its weatherproof polycarbonate construction, the MIS8C is useable both indoors and outdoors, as well as in high-temperature environments. It is a favorite for mine safety applications.

The gray-finished horn provides loading down to 500 Hz, and there is useable output up to 13 kHz. Optimum results are obtained when the unit is used in the 600 Hz to 7 kHz region.

Its wide, uniform dispersion enables the MIS8C to deliver clear, intelligible speech over a wide area (especially in tight spaces). In addition to its value as a low-power loudspeaker, the MIS8C serves as a sensitive "mic" in talkback applications (i.e., 2-way paging systems).

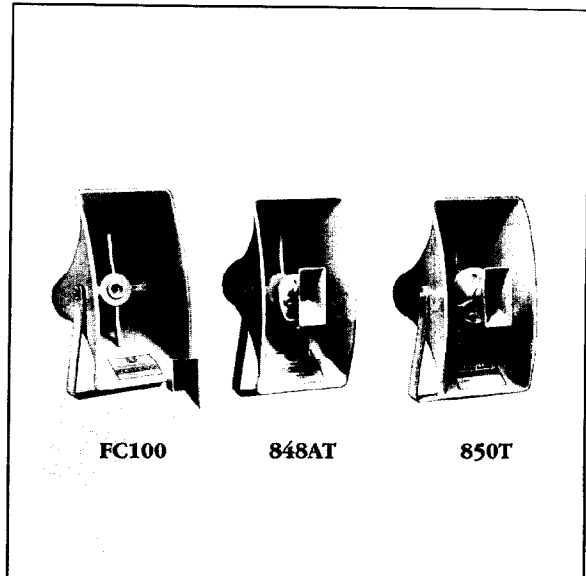
MIS8C SPECIFICATIONS

Frequency Response	500 Hz – 13 kHz, ± 11 dB; 600 Hz – 7 kHz, ± 6 dB
Power Handling	10 watts (500 Hz – 3 kHz pink noise)
Sensitivity	101 dB SPL, 1W, 1m (500 – 3 kHz pink noise)
Impedance	8 Ω nominal
Beamwidth	153° @ 2 kHz (mounted on 2' x 3' baffle)
Directivity Factor (RoQ)	7 @ 2 kHz
Voice Coil Diameter	1.0" (2.54 cm)
Sensitivity as Microphone	-26 dBm (ref.: 10 dynes/cm ²)
Heat Deflection Temp.	Horn housing: 280°F (138°C); Reflector: 225–240°F (107–114°C)
Flamability Rating	Horn Housing meets UL standard UL94V-2
Dimensions	5.5" (140 mm) max. dia. x 4.2" (107 mm) deep; 6 holes on 1.9" (49 mm) diameter circle
Shipping Weight	2.5 lb (1.1 kg)

Compound Diffraction Projectors

FC100, 848AT, & 850T CDPs

Compound Diffraction Projectors



FC100

848AT

850T



- Coaxial horns couple to both sides of the driver for clean, extended response
- Horn-only unit available (FC100)
- 848AT is FC100 horn & 1828T 30W-driver
- 850T is FC100 horn & 1829T 60W-driver
- 85° x 130° coverage @ 2 kHz (850T)
- 110° x 130° coverage (848AT & FC100)

The 848AT and 850T are wide-range, integrated horn-and-driver systems in which a single driver is fitted to two coaxial horns, each coupled to opposite sides of the driver diaphragm. The two models are very similar, differing only in the driver used: the 848AT uses a 30-watt 1828T driver, while the 850T uses a 60-watt 1829T driver. (The physical size of the larger 1829T alters the polar response of the horn somewhat.) The FC100 is the same gray, fiberglass and die-cast-zinc horn used by both the 848AT and 850T, but packaged without a driver.

Within each compound diffraction projector, the rear-horn section is folded, whereas the smaller, front-horn section is straight (it may be rotated 90° to alter the dispersion of the highs with respect to the lows). The horns are designed so it creates a 1-kHz acoustic crossover which, by separating the frequencies, provides extended high-frequency response and cleaner sound. This design also provides excellent loading for useable output down to very low frequencies (200 Hz in the 848AT, 180 Hz in the 850T).

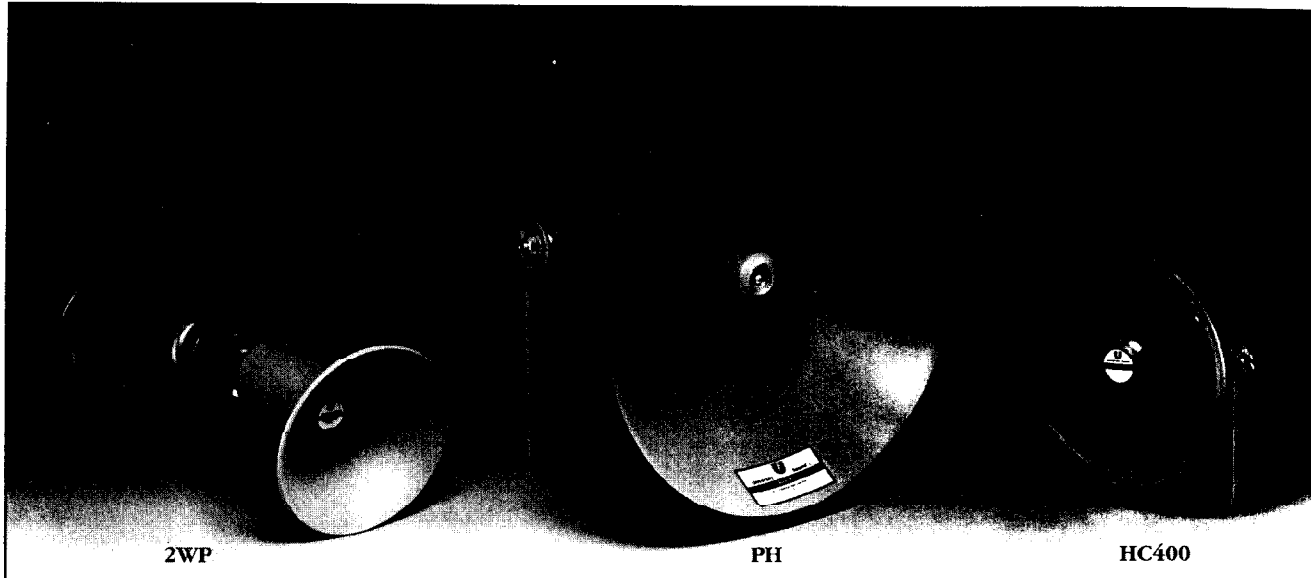
The drivers in the 848AT and 850T include built-in transformers, with adjustable power taps, for use in 25V or 70.7V distributed systems. Wide dispersion, high sensitivity, and resistance to extremes of weather (including humidity and fungus) make these projectors ideal for indoor or outdoor use in medium- to high-power PA applications.

FC100, 848AT & 850T SPECIFICATIONS

Frequency Response (±5 dB)	200 Hz – 10 kHz (848AT); 280 Hz – 8 kHz (850T)
Lower Useable Limit	200 Hz (848AT); 180 Hz (850T)
Power Handling	30 W (848AT); 60 W (850T) (500 Hz – 5 kHz pink noise)
Sensitivity	105 dB SPL, 1W, 1m (500 – 5 kHz pink noise)
Driver Specs	(See 1828T & 1829T driver data on page 25)
Beamwidth @ 2 kHz	85° H x 130° V (848AT); 110° H x 130° V (850T)
Directivity Factor (RoQ)	6 @ 2 kHz; 7 (848AT); 5.2 (850T)
Dimensions (H x W x D)	20.5 (520 mm) x 11.5 (293 mm) x 2.0 (51 mm)
Net Weight	10.0 lb (4.5 kg) (848AT); 10.0 (4.5 kg) (850T)
	20.8 (519 mm) x 11.0 (280 mm) x 2.0 (51 mm)
Shipping Weight	18.0 (8.2 kg) (848AT); 21.0 (9.5 kg) (850T)
	21.8 (9.9 kg) (FC100)

Reentrant Horns

HC400, PH, SMH, SH, & 2WP Reentrant Horns



- Voice paging and music (PH, SMH)
- Primarily voice paging (HC400, 2WP)
- Select for dispersion and “throw”
- Unique 0°/30°/45° adjustable bracket (PH, SMH)
- High-efficiency, exponentially-flared trumpets

These horns vary in size, lower cutoff frequency and nominal dispersion angle. In addition, they each accept a variety of University screw-on drivers (1828R, 1824S, 1829, 1D30, 1D60, 1D125 & 7110XC drivers, for example), permitting flexibility in both power output and frequency range. The horns and hardware are fully weather proofed (metal with baked enamel finish) and may be used in any indoor or outdoor location.

HC400

The HC400 is a compact reentrant horn designed to provide high articulation in difficult paging applications. When used with the recommended Model 1829 driver, it becomes a wide-range, efficient paging projector. It may be used with any University threaded driver, however, and the 1824S is recommended when maximum output is desired in the midrange. For the most economical package, where extended high-frequency response is not required, the 1828R driver may be used.

The HC400 is especially useful in medium-throw applications, and in locations where it is desirable to limit high-frequency coverage. A unique, adjustable mounting bracket (with holes for mounting a matching transformer) may be removed without completely removing the two wing-nuts that secure it, facilitating bracket and horn installation.

PH, SMH & SH

The PH, SMH and SH are exceptionally efficient reentrant horns, utilizing exponentially-flared trumpets with 3.5-foot, 2.5-foot or 1.5-foot-long air columns respectively. They offer a combination of low distortion and high output, along with remarkable amplifier economy. A positively-flaking, mounting bracket facilitates convenient mounting in any position. The PH, SMH, and SH are good choices for parking areas, freight yards, factories, and schools.

2WP

The 2WP is a bi-directional approach to paging, utilizing a pair of horns that share a common bracket and use a single driver through a special T1 coupler. Only 1.5 volts per unit, the 2WP is useable with any University driver. A unique mounting bracket permits the sound to be projected either 10° outward or 1° downward. Typical uses include paging, as well as playback where the driver acts as a microphone in conditions of loud stations, loading ramps, and airline bus railway waiting areas.

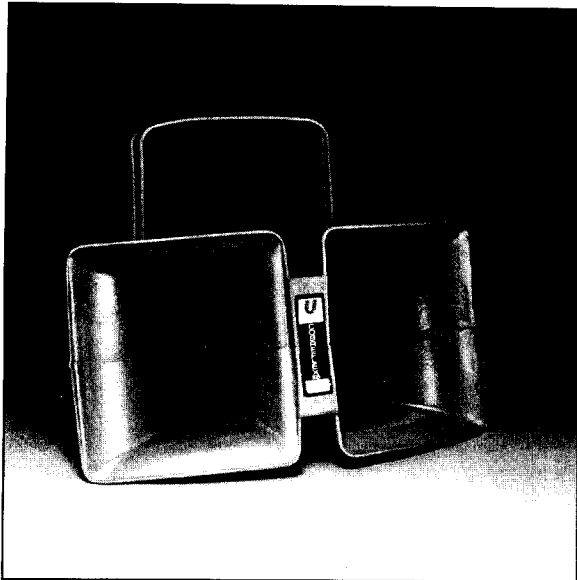
SPECIFICATIONS

HORN MODEL	LOW-FREQ ROLLOFF ¹		DISPERSION ²			THROAT DIAMETER	AIR COLUMN LENGTH	DIMENSIONS (Diam. x depth)		SHIPPING WEIGHT
	-6 dB	-12 dB	1 kHz	2 kHz	4kHz					
HC400	400 Hz	300 Hz	130°	60°	35°	0.7"	18"	10" x 5.2"	(25.4 x 13.2 cm)	4.5 lbs (2 kg)
PH	300 Hz	200 Hz	50°	40°	36°	0.7"	42"	20.4" x 15.8"	(51.8 x 40.1 cm)	11.75 lbs (5.3 kg)
SMH	500 Hz	120 Hz	82°	42°	37°	0.7"	30"	16.5" x 12.1"	(41.9 x 30.7 cm)	8.25 lbs (3.7 kg)
SH	400 Hz	300 Hz	129°	70°	35°	0.7"	18"	8.75" x 7"	(22.2 x 17.8 cm)	2.75 lbs (1.25 kg)
2WP	600 Hz	400 Hz	135°	74°	42°	0.7" or 1"	18"	8.5" x 20.5"	(21.6 x 52.1 cm)	4.5 lbs (2 kg)

1. Low-frequency limit based on capability of driver used. If horn cutoff is higher than rated LF limit of driver, cutoff will be determining factor.
 2. Polar curves @ 10' in an anechoic chamber. ¹/3 octave band limited pink noise (+0 dB points)

Reflex Horns

Cobraflex IIB Folded Sectoral Horn



- **High efficiency & low cutoff frequency in a compact physical size**
- **80° H x 60° V dispersion @ 2 kHz**
- **Patented design eliminates HF phase cancellation**
- **Durable ABS horn & painted steel bracket**

The Cobraflex IIB is an exponentially flared, reflex (folded) design for use in public address, paging and voice warning systems. Its patented design (N° 2,751,996) utilizes two separate air columns, folded back into a single driver, which virtually eliminates high frequency phase cancellation present in reentrant designs. (High frequency sound-waves which take multiple paths in a single-horn design can meet within the horn, after reflecting across different path lengths, causing them to be out-of-phase; the energy may partially or completely cancel itself before it ever exits the horn. The dual-column design of the Cobraflex avoids most of this effect, optimizing delivery of high frequency energy.)

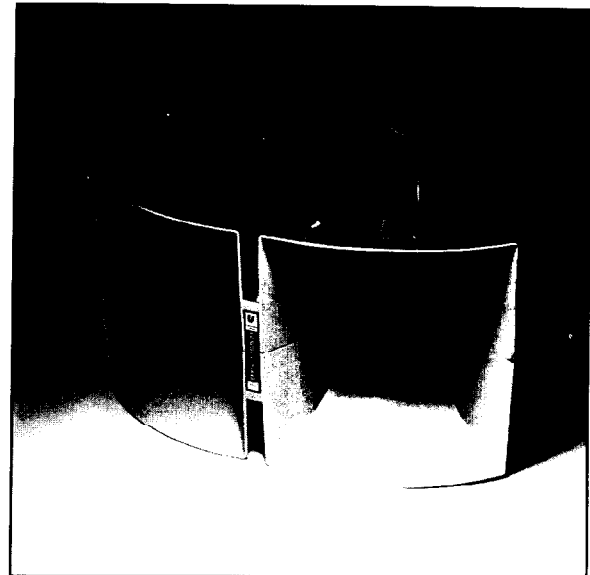
The 80° horizontal by 60° vertical pattern is beneficial in many applications requiring a wide coverage pattern. Since the path length and mouth area are large for this relatively compact horn, excellent driver loading is maintained down to a low-frequency cutoff of 250 Hz, which enables the Cobraflex IIB to do a good job with music reproduction.

A threaded, metal throat-insert accommodates a variety of standard University screw-in drivers, completing this compact, high efficiency package. The completely weatherproof, high impact ABS horn is coated with ultraviolet light-inhibiting gray paint that holds up indefinitely under direct sunlight, making the Cobraflex IIB a fine choice for outdoor or indoor use.

Cobraflex IIB SPECIFICATIONS

Beamwidth (@ 2 kHz)	80° H x 60° V
Directivity Factor R _d (Q)	9.1 @ 2 kHz
Lower Useable Limit	250 Hz minimum
Driver Connection	Threaded metal throat insert accommodates screw-in driver with throat opening of 0.77" to 1.0" diameter, and standard 1/8" - 18 thread.
Dimensions (H x W x D)	9.3" (23.5 cm) x 18.5" (47.0 cm) x 10.3" (26.0 cm)
Net Weight	5.1 lb (2.3 kg)
Shipping Weight	6.7 lb (3.0 kg)

Cobraflex III Folded Sectoral Horn



- **Very high efficiency & low cutoff frequency**
- **100° H x 60° V dispersion @ 2 kHz**
- **Patented design eliminates HF phase cancellation**
- **Durable Glass-Fibre-Reinforced Polyester (FRP) h.**

The Cobraflex III is a reflex (folded) sectoral wide angle horn for use in public address, paging and voice warning systems. Its patented design (N° 4,176,731) utilizes two separate air columns, folded back into a single driver, which virtually eliminates high-frequency phase cancellation present in reentrant designs. (High frequency sound waves which take multiple paths in a single-horn design can meet within the horn, after reflecting across different path lengths, causing them to be out-of-phase; the energy may partially or completely cancel itself before it ever exits the horn. The dual-column design of the Cobraflex avoids most of this effect, optimizing delivery of high frequency energy.)

The 100° horizontal by 60° vertical pattern is beneficial in many applications requiring a wide coverage pattern. Furthermore, excellent driver loading is maintained down to a low-frequency cutoff of 250 Hz, which enables the Cobraflex III to do a good job with music reproduction.

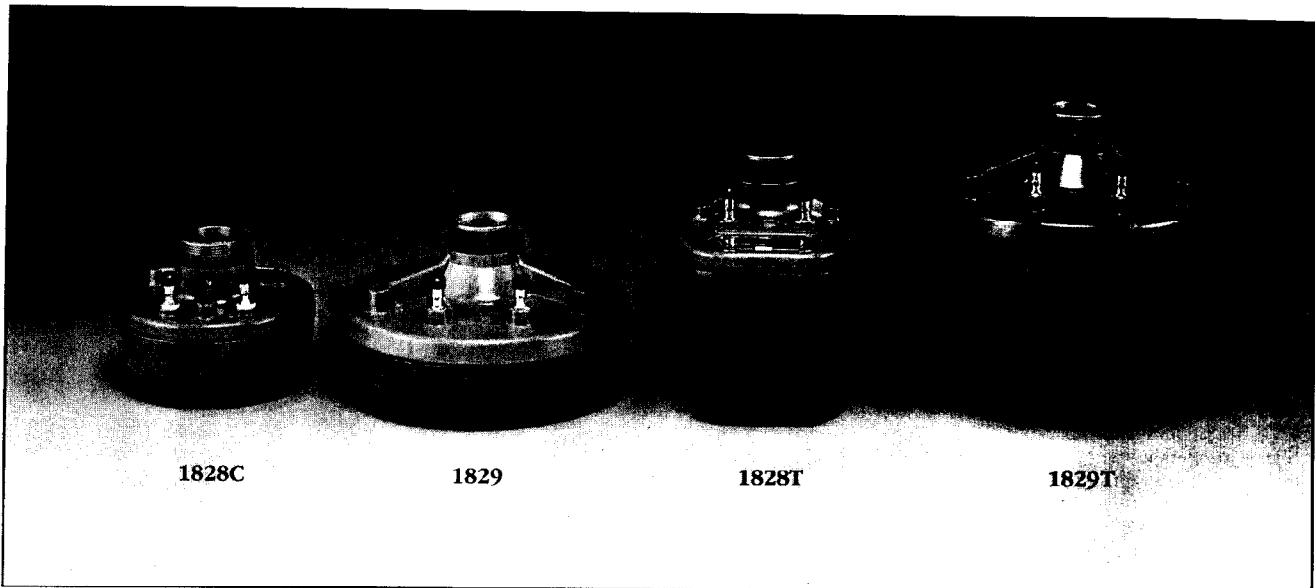
A threaded, metal throat-insert accommodates a variety of standard University screw-in drivers to create a very high-efficiency package that is ideal where greater output level than the Cobraflex IIB delivers is required, and limited space is not a factor. The completely weatherproof horn is constructed of non-resonant glass fibre reinforced polyester with a self-colored gray finish. A serrated positive lock "U" mounting bracket provides mounting flexibility and ease of installation. The Cobraflex III a fine choice for outdoor or indoor use.

Cobraflex III SPECIFICATIONS

Beamwidth (@ 2 kHz)	100° H x 60° V
Directivity Factor R _d (Q)	15.9 @ 2 kHz
Lower Useable Limit	250 Hz minimum
Driver Connection	Threaded metal throat insert accommodates screw-in driver with throat opening of 0.77" to 1.0" diameter, and standard 1/8" - 18 thread.
Dimensions (H x W x D)	14.5" (36.8 cm) x 27.5" (69.2 cm) x 15.0" (38.1 cm)
Net Weight	7.0 lb (3.2 kg)
Shipping Weight	11.0 lb (5.0 kg)

CDP Drivers

1828C, 1828T, 1829, 1829T CDP Compression Drivers



- 30 watt (1828) and 60 watt (1829) ratings
- Wide Frequency Response
- Heavy-duty drivers with or without transformer
Convertible for use with CDP or other horns

The 1828C, 1828T, 1829 and 1829T are heavy duty convertible drivers designed for public address installations. With both protective plastic caps and the foam loading plug removed, the units are suitable for mounting on University Compound Diffraction Projectors (CDPs). With the rear cap and plug attached, the drivers may be used with other horn types.

The 1828 series are rated at 30 watts pink noise and are intended for use in medium-power systems, whereas the 1829 series are rated at 60 watts for higher-power systems. The "T" suffix indicates that a transformer is built into the driver housing, with screw-driver-adjustable power tap selection for use with 25 and 70 volt lines.

The exterior finish of these drivers is a durable, weatherproof paint, and all metal parts have been treated for resistance to high humidity and fungus. Ideal for both indoor and outdoor applications, these drivers are well suited for any installation requiring rugged and reliable performance.

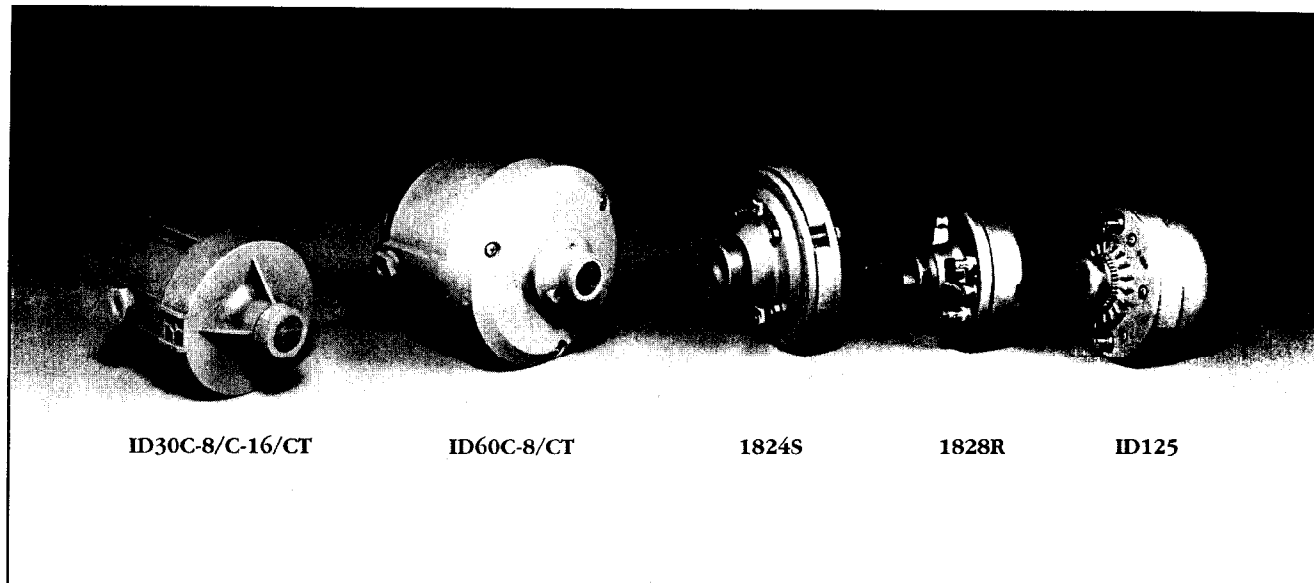
1828C, 1828T, 1829, 1829T SPECIFICATIONS

Frequency Response	260 Hz – 10 kHz, ± 5 dB (1828)		280 Hz – 8 kHz, ± 6 dB (1829)	
Power Handling (500 – 5k Hz pink noise)	30 watts (1828); 60 watts (1829)			
Sensitivity (on FC100 horn) (500 – 5k Hz pink noise)	105 dB SPL, 1W, 1m			
Nominal Impedance	8 Ω (1828); 16 Ω (1829)			
Minimum Impedance	6.5 Ω (1828); 11 Ω (1829) on FC100 horn			
Magnet Material	Strontium ferrite			
Construction	1" x 1" – 18 thread allows driver to be mounted on most University Sound horns			

	1828C	1828T	1829	1829T
<i>Dimensions:</i> Diameter	3.308 (3")	NA	5.3 (13.5)	5.3 (13.5)
<i>inches (cm)</i> Height	NA	5.0 (12.7)	NA	NA
Width	NA	4.0 (10.2)	NA	NA
Depth	4.0 (10.2)	5.3 (13.3)	4.1 (10.3)	6.4 (16.2)
Net Weight: lb (kg)	4.7 (2.2)	5.0 (2.3)	7.0 (3.2)	9.8 (4.5)
Shipping Weight: lb (kg)	5.2 (2.4)	5.5 (2.5)	7.8 (3.5)	10.6 (4.8)

Miscellaneous Drivers

1824S, 1828R, ID30C-8, ID30C-16, ID30CT, ID60C-8, ID60CT, ID125 Compression Drivers



- Assorted power ratings: 20, 30, 40, 60, 75 and 125 watts
- Select by response characteristics for siren drivers, general paging, or background music
- Rugged, weather-resistant phenolic diaphragms and indoor/outdoor packaging
- Models with or without transformer

This assortment of compression drivers encompasses a variety of power ratings, frequency response characteristics, and package sizes, and therefore may be used in a very wide spectrum of applications. All models have a 1" x 18 thread which allows the driver to be mounted on most University Sound horns (these drivers are not suited for CDPs). The "T" suffix on certain models indicates that a transformer is built into the driver housing, with a screwdriver-adjustable power tap for use with 25 and 70 volt lines.

1824S

The 1824S is a heavy-duty driver designed for use in fixed or mobile siren warning systems. It is able to handle sustained, very high levels (75 watts band-limited pink noise) over the rated range of 300 to 3,000 Hz. Special construction ensures absolute concentricity of the voice coil. Automotive-type terminals are used, and mating connectors provided, for making electrical connection. The unit has a diecast front cover with thermal black finish.

1828R

The 1828R is a high-efficiency, wide-range driver rated at 30 watts band-limited pink noise. It is an excellent choice for medium-power public address applications such as

gymnasiums, auditoriums, factories, parking areas, and outdoor meetings. Its "peaked" response enhances articulation and reduces listening fatigue. The unit features a field-replaceable phenolic diaphragm, and is finished in baked Mesa Tan enamel paint.

ID30C-8, ID30C-16, ID30CT

These three drivers all are rated at 30 watts band-limited pink noise and are for use in medium-power public-address applications. Rim-centered voice coils and phenolic diaphragms assure long life under extreme operating conditions; the diaphragm assembly is field-replaceable. A weatherproof rear housing provides for quick connection using the sealed gland nut provided (a standard 1/2-inch BX connector can be substituted). The transformer model (ID30CT) includes connections for 25V and 70V distributed systems, with a switch for any of 6 power levels. The other two models are configured for direct amplifier connection as 8 ohm (ID30C-8) or 16 ohm (ID30C-16) drivers. Exterior parts are injection molded polycarbonate, and all metal parts are treated for resistance to fungus and to high humidity.

ID60C-8, ID60CT

These drivers all are nearly identical to the ID30 series 8 ohm and transformer models, but are rated at 60 watts for higher powered public address systems.

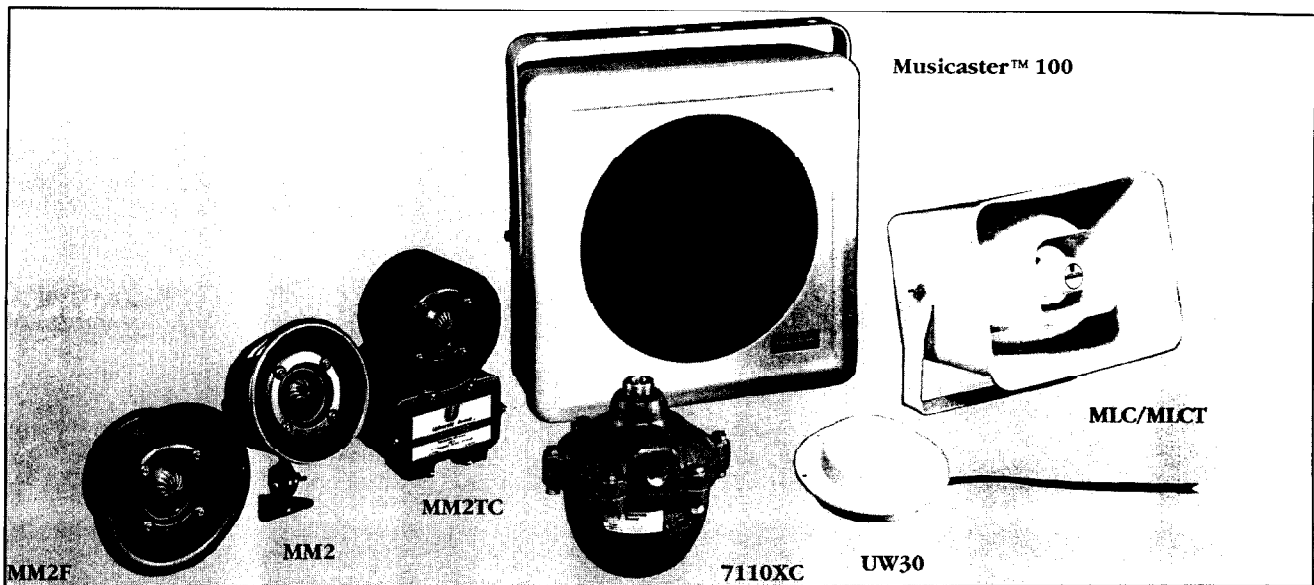
ID125

The ID125 is a heavy-duty, very high output driver for use in applications requiring continuous, high-level acoustic output (such as sirens) and for high-level speech projection. A split path palate diaphragm with convex-concave configuration produces extraordinary dependability and power handling capacity. The rugged case will withstand extreme environments and rough handling.

SPECIFICATIONS	1824S	1828R	ID30C Series	ID60C Series	ID125	
Frequency Response (Hz)	300 - 3k, ± 5 dB	190 - 8k, ± 5 dB	500 - 4k, ± 5 dB	500 - 4k, ± 5 dB	150 - 7k, ± 5 dB	
Power Handling (500 - 5k Hz pink noise)	75 watts	20 watts	30 watts	60 watts	125 watts	
Sensitivity (1W, 1m, 500 - 5k Hz pink noise, Cobratflex III horn)	107 dB SPL	105 dB SPL	106 dB SPL	107 dB SPL	105 dB SPL	
Nominal Impedance	8 Ω	8 Ω	8 Ω (ID30C-8) 16 Ω (ID30C-16) NA on ID30CT	8 Ω (ID60C-8) NA on ID60CT	16 Ω (8 Ω on special order)	
Color	Thermal black	Grey	Grey (C8 or C16 • ID30CT)	Grey (C8 or C16 • ID30CT)	Grey	
Dimensions: inches (cm)	Diameter	5.2 (13.2)	4.2 (10.6)	5.6 (14.3)	4.25 (10.8)	
	Depth	3.1 (7.9)	2.8 (7.1)	5.2 (13.2)	6.4 (16.2)	9.5 (3.75)
Shipping Weight (lb (kg))	Net Weight (lb (kg))	6.4 (2.9)	3.5 (1.6)	5.9 (2.7)	7.4 (3.4)	8.2 (3.7)
	Shipping Weight (lb (kg))	7.0 (3.2)	5.2 (2.3)	4.6 (1.8)	5.8 (2.6)	6.3 (2.9)

Special Purpose Transducers

7110XC, MM-2, MM-2F, MM-2TC, MLC, MLCT, UW30, Musicaster™ 100 Drivers & Loudspeakers



- **7110XC driver won't detonate an explosive environment**
- **MM2 Series speakers for use near water or spray**
- **MLC & Musicaster 100 indoor/outdoor loudspeakers**
- **UW30 loudspeaker for use in pools or aquarium tanks**

7110XC

The 7110XC "explosion proof" driver will not create a spark or detonate an explosive atmosphere. (It is not made to survive an explosion.) Its integral sintered-bronze acoustic screen and heavy die cast aluminum case meet the UL standards for explosion proof classification. It meets or exceeds standards for use in hazardous areas classified as Class I - Groups B, C and D, plus Class II - Groups E, F and G.

The 7110XC is ideal for use in gasoline storage and loading facilities, coal pulverizing plants, grain mills, paint shops, or other areas with potentially volatile atmospheres containing alcohol, acetone, natural gas and other explosive gases. It can be used with any University Sound reflex horn, but is most often used with the PH, SMH, Cobraflex IIB or Cobraflex III. The University Model 5030 line transformer can be installed if necessary. The optional PS-1 pressure seal connector provides an airtight cable entrance eliminating the need for costly, elaborate pressurized conduit; an 18' type 18-2SV cable is included.

MM-2, MM-2F

The MM-2 is a submergence proof design (U.S. Navy spec), not damaged by water, live steam or mist. A serrated mounting bracket allows it to be swiveled through a 90° vertical arc when mounted on walls, ceilings, vehicle roofs, etc. - in such locations as docks, bridges, boiler rooms, railroads, and all types of boats and ships. The MM-2F is nearly identical, but designed for flush mounting. These units are fully protected against damage by high humidity, salt water, and many other environmental conditions. The fungicide-treated, plastic-impregnated diaphragm is easily accessible for cleaning. The MM-2 series are useable as siren (warning) speakers yet have sufficiently wide range response for excellent voice reproduction in paging applications.

MM-2TC

This model is similar to the MM-2, but instead is designed for mounting on the front surface of a bulkhead, wall, or ceiling. An integral housing provides space for protected installation of a matching transformer (such as the University 5015, 5030, TM15 or TM50) for use with 25V or 70V lines.

MLC and MLCT

The MLC is a high-fidelity, two-way weatherproof loudspeaker system. The compact, fiberglass, folded horn contains a cone-type extended-range woofer, a high frequency compression driver, and a crossover network. The MLC has an 8-ohm input, the MLCT has a transformer for 25V or 70V lines; both are ideal for indoor or outdoor use.

UW30

The UW30 is designed for mounting and use entirely under water. The case's structural enclosure is the sound transducer (U.S. pat. N. 3671290), housing possible a speaker with no exposed metal parts. This prolongs life expectancy, and enables the unit to operate to much greater depths than possible with previous technologies (may be pressurized for depths to 10 feet). The outer case is high-impact ABS, and inner parts are "hot melt" encapsulated. Designed for permanent mounting, the unit will easily withstand salt water environments. A single UW30 is sufficient for swimming pools of up to 30'x30'.

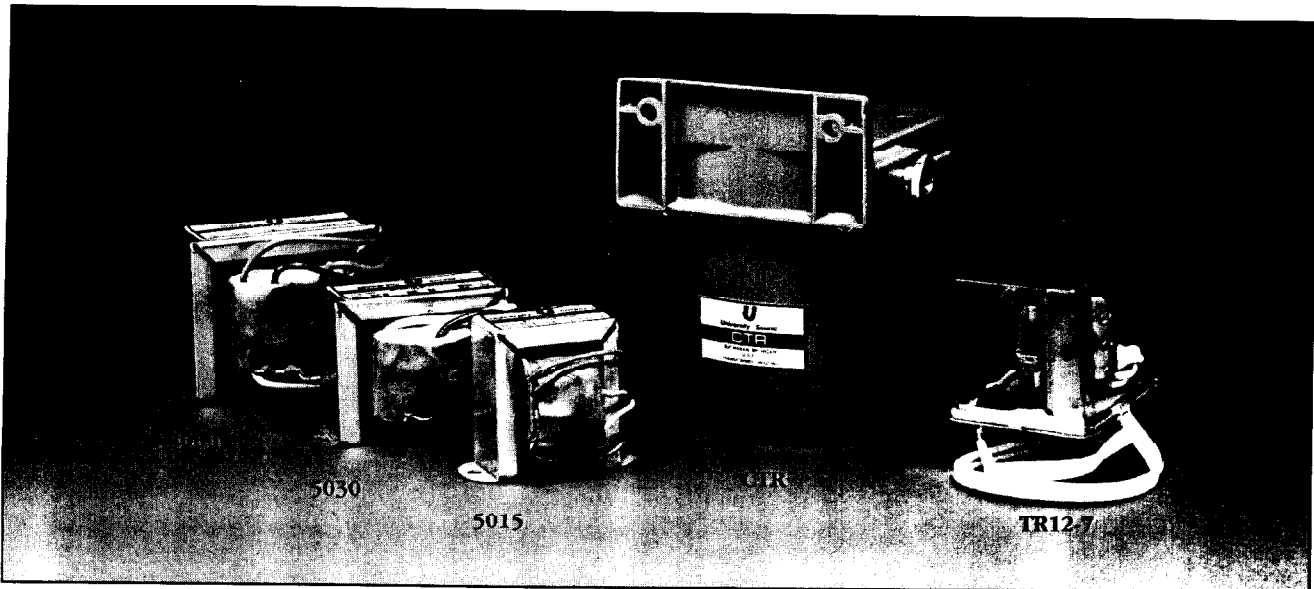
Musicaster™ 100

The Musicaster 100 is a compact, high fidelity speaker system for voice or music reproduction. A dome tweeter coupled to a constant-directivity horn is coaxially mounted in front of a 12-inch direct radiator (cone-type driver), transitioning at 1,500 Hz for wide, even midrange dispersion. The enclosure is one-piece, molded polyethylene, and all parts of the system are both weatherproof and fungus-resistant. An optional transformer kit (TK60) is available for 25V or 70V lines. The U-bracket handle and/or eye bolts may be used for mounting (1/4"-20 inserts are built in).

SPECIFICATIONS	7110XC	MM-2	MM-2F	MM-2TC	MLC, MLCT	UW30	Musicaster 100
Frequency Response (Hz)	500 - 10k, ±5 dB	350 - 10k, ±5 dB	350 - 10k, ±5 dB	350 - 10k, ±5 dB	150 - 15k, ±3dB	100 - 10k, ±5 dB	90 - 18k, ±5 dB
Power Handling* (* 500 - 5k Hz pink noise)	30 watts	25 watts	25 watts	25 watts	15 watts	30 watts	60 watts
Sensitivity (dB SPL @ 1W, 1m ²)	107 (CF III horn)	104 dB SPL	104 dB SPL	104 dB SPL	104 dB SPL	NA	99 dB SPL
Dispersion (@ 2 kHz)	NA	95°	95°	95°	120°	NA	NA
Nominal Impedance	8Ω (on Cobraflex III horn)	16 Ω	16 Ω	16 Ω (w/o line transformer)	8Ω (MLC); 25 or 70V (MLCT)	8Ω	8Ω
Color	Gunmetal gray	Gunmetal gray	Gunmetal gray	Gunmetal gray	White	Pool Blue	Beige
Dimensions - Diameter	7.9 (20.0)	6.0 (15.2)	7.3 (18.5)	NA	NA	7.2 (18.5)	NA
Height	NA	NA	NA	10 (25.4)	9.1 (23.1)	NA	17.5 (44.5)
Width	NA	NA	NA	6.4 (16.5)	12.8 (32.5)	NA	17.5 (44.5)
Depth	7.4 (18.7)	5.0 (12.7)	3.8 (9.5)	4.4 (11.5)	10.7 (27.2)	2.0 (5.1)	8.5 (21.6)
Net Weight: lb (kg)	12.0 (5.4)	5.3 (2.4)	6 (2.7)	8.8 (4.0)	10.8 (4.9)	4.0 (1.8)	24.6 (11.2)
Shipping Weight: lb (kg)	12.8 (5.6)	6 (2.7)	9 (4.1)	10 (4.5)	11.3 (5.1)	4 (1.8)	29.0 (13.2)

Horn, Driver & Projector Accesories

AT100, TR12-7, 5005, 5015, 5030, 5060, TM5, TM15, TM30, TM60, TK60 Transformers



- Match low-Z paging loudspeakers to 25V or 70V lines
- Autotransformer (AT100) or dual-winding transformers
- Variety of power ratings from 5 to 100 watts
- Multiple power taps for local level adjustment

Constant-voltage (CV) loudspeaker distribution was developed specifically for distributed paging and public address systems. It relies upon standardizing the RMS voltage level of distribution lines at 25 or 70 volts (technically 70.7 volts). Transformers are utilized at each loudspeaker to regulate the proportion of the total amplifier power that the speaker "sees." This results in a very reliable system, as long as the net power demanded by each branch does not exceed the rated power of the driving amplifier; if one or more speakers become disconnected or fail, the others operate at the same level.

Constant-voltage distribution greatly simplifies system design; speakers can be freely added to (or subtracted from) the system without the relatively tedious recalculation of total load impedance, and a single amp can drive many speakers without resorting to series-parallel connection techniques. The transformers listed here are for CV systems.

AT100

The AT100 is a wide-range autotransformer designed for use in high-quality distributed sound systems, or other impedance matching situations where line losses must be minimized and dc isolation is not required. The unit is capable of stepping down the impedance of a 70.7 volt line to match an 8-ohm speaker (of up to 100 watts). Conversely, the unit can be used to step up the output impedance of amplifiers rated at up to

100 watts for driving 70V lines. The AT100 has six power impedance taps, may be used with 100 volt lines, and will handle as much as 200 watts peak power in this application, so long as the long-term average power delivered by the amp does not exceed 100 watts. The extremely low insertion loss of the AT100 allows virtually all of that power to be transferred to the line, maximizing the capabilities of the system.

TR12-7

The TR12-7 transformer is a 70.7 volt line matching transformer designed for easy mounting on the University PA12 paging projector. The clear transformer cover allows viewing of the selected power taps with out removal, and snaps off to permit adjustment of the taps. The transformer is vacuum varnished for full protection from weather, moisture and fungus damage.

5005, 5015, 5030, 5060 (& CTR)

These line matching transformers are for 8-ohm loudspeakers which must be matched to 25 or 70.7 volt lines. Their simple U-frame design includes a pair of mounting holes which permit them to be screwed onto almost any surface; connections to the various power taps are made via lead wires. These models are rated at 5, 15, 30 and 60 watts respectively. The CTR is an optional housing to protect these transformers.

TM5, TM15, TM30, TM60 (& TK60)

These are 5, 15, 30 and 60 watt line universal line matching transformers similar to the above items, with terminal lugs instead of leads, and for 8- or 16-ohm loudspeakers. The TK60 is a kit consisting of a TM60 on an input panel, for use with the Musicaster TM100.

SPECIFICATIONS	AT100	TR12-7	5005	5015	5030	5060	TM5	TM15	TM30	TM60
Frequency Response (±3 dB)	60 - 20k Hz	90 - 15k Hz	50 - 10k Hz	50 - 10k Hz	100 - 10k Hz	50 - 7k Hz	35 - 20k Hz	35 - 20k Hz	35 - 20k Hz	35 - 20k Hz
Power Handling	100 watts	12 watts	5 watts	15 watts	30 watts	60 watts	5 watts	15 watts	30 watts	60 watts
Insertion Loss	1 dB	1 dB	1.5 dB	1 dB	1 dB	1 dB	0.80 dB	0.60 dB	0.45 dB	0.25 dB
Line Voltage	100, 70.7 or 25 V	70.7 V	70.7 or 25 V	70.7 or 25 V	70.7 or 25 V	70.7 or 25 V	70.7 or 25 V	70.7 or 25 V	70.7 or 25 V	70.7 or 25 V
Package	Open frame	Plastic covered	Open frame	Open frame	Open frame	Open frame	Open frame	Open frame	Open frame	Open frame
Power Taps (Based on 70.7V lines)	100, 70.7, 50, 16, 8 & 4 ohms	12, 6, 3, 1.5, 0.75 W	5, 2, 1, 0.5 W	15, 7.5, 3.8, 1.9, 1, .5 W	30, 15, 10, 5, 2.5, 1.25 W	60, 30, 15, 7.5, 3.75, 1.88 W	.62, 1.25, 2.5, 5 W	1.87, 3.75, 7.5, 15 W	3.75, 7.5, 15, 30 W	7.5, 15, 30, 60 W
Power Selection	Lead wires	Single push-clip	Lead wires	Lead wires	Lead wires	Lead wires	Lugs	Lugs	Lugs	Lugs
Diameter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimensions: Height Width Depth	3.8 (9.5) 3.5 (8.9) 3.1 (7.9)	2.8 (7) 1.9 (4.8) 1.9 (4.8)	1.7 (4.3) 2.0 (5.1) 1.5 (3.9)	1.9 (4.8) 2.4 (6.0) 1.9 (4.8)	1.9 (4.8) 2.9 (7.3) 2.0 (5.1)	2.3 (5.7) 3.7 (9.4) 2.3 (5.7)	1.9 (4.9) 2.4 (6.1) 1.6 (4)	2.4 (6.1) 2.9 (7.4) 1.9 (4.8)	2.8 (7.1) 3.1 (7.9) 2.0 (5.1)	3.1 (7.9) 2.5 (6.4) 3.6 (9.1)
Net Weight: lb (kg)	6.0 (2.7)	0.5 (0.2)	0.6 (0.3)	1.5 (0.7)	2.0 (0.9)	2.5 (1.1)	-	-	-	-
Shipping Weight: lb (kg)	7.0 (3.2)	0.6 (0.3)	0.7 (0.3)	2.1 (1.1)	3.1 (1.4)	3.7 (1.7)	1.0 (0.5)	1.5 (0.7)	2.0 (0.9)	2.5 (1.1)

An Introduction to University Speaker Systems

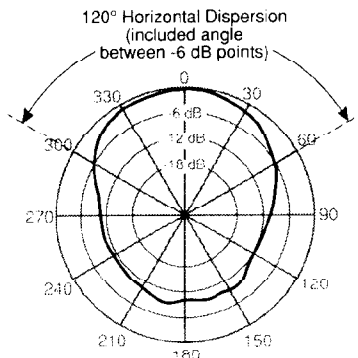
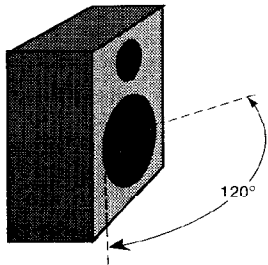
University speaker systems offer convenience and performance

A speaker system (loudspeaker system) may be comprised of a single driver in an enclosure, or of multiple drivers, horns, crossover networks, and so forth. Basically, any set of speaker components designed to produce a specified result can be considered a "system." On the prior pages of this catalog are listed a wide variety of horns and compression drivers, many of which function without additional components for paging or foreground/background music. The following pages, however, contain products which may be more properly described as complete loudspeaker systems: University Line Radiators, the University Interface Series, and the University Permanently Installed Loudspeaker Systems. These products include drivers, crossover networks and enclosures which have been carefully designed and assembled to provide optimum results in diverse applications.

Beamwidth and dispersion

Any speaker system should be selected to fulfill specific criteria. The dispersion angle of the sound defines the primary coverage area. Except in the case of constant-directivity (C-D) horns, coverage for a given driver generally narrows with increasing frequency; then, at the crossover to the next smaller diameter driver, coverage again broadens, and begins narrowing with further increases in frequency. For this reason, beamwidth specifications in this catalog are always accompanied by a reference frequency; the beamwidth is the included angle within which the sound level falls off no more than 6 dB relative to the front (0° on-axis) sound level. Bear in mind that beamwidth specifications are derived at a constant radius from the speaker; if the speaker is aimed at a flat, perpendicular plane (a wall or row of seats, for example), the actual fall-off in level to the sides will be even greater due to the increased distance from the speaker.

Dispersion as shown pictorially and with a polar plot



Systems with wide dispersion cover more territory, but also deliver lower sound pressure level to any given person within that area than a system which may be equally efficient with a narrower coverage angle. Therefore, one must examine coverage within the context of *required coverage*.

Reverberation generally degrades intelligibility. When a speaker with wide coverage is aimed so that much of its sound strikes adjacent wall, ceiling, and/or floor surfaces, excess reverberation is created. In addition, early reflections of the sound combine with the direct sound from the speaker to create deep notches in response known as "comb filtering" — notches for which no amount of equalization can adequately compensate. Therefore, it is generally desirable to use a system with sufficient dispersion (beamwidth) to cover the listeners, but not so wide as to cause excess reflections from adjacent surfaces. Be sure to take these factors into consideration when selecting a system.

University Line Radiators, as explained on subsequent pages, are advantageous for use in clubs, meeting rooms, or other areas which typically have low ceilings and close-in seating. In such cases, wide horizontal dispersion is required to cover the seats, yet narrow vertical dispersion is required to avoid bouncing sound off the ceiling or wasting it on the floor. Line radiators perform this function.

The Permanently Installed (PI) systems utilize a moderate-dispersion, constant directivity ST350B compression tweeter so that frequency response remains reasonably constant within the covered area. The Interface Series, which consist entirely of direct radiating cone-type drivers, offer wide horizontal and vertical dispersion.

Working with dispersion

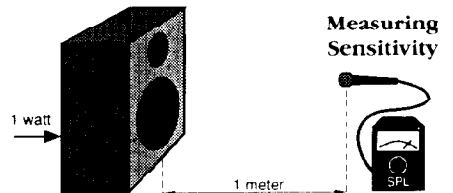
University has devised a straightforward method to map the actual dispersion of our speaker systems into specific acoustic environments, taking into account the angle at which the speaker is aimed, its relative height over the listeners, and the varying dispersion with frequency. This method is called easy-VAMP™ (Very Accurate Mapping Program), in which clear overlays are provided for each speaker system, and these overlays are simply placed atop correctly scaled architectural drawings to display the in-place coverage. Information on easy-VAMP is presented in the University Sound Guide (available on request).

Power handling, sensitivity and efficiency

"Sensitivity" and "efficiency" are related, but not identical terms that describe the output of a speaker system. Sensitivity, as it is now generally presented, is defined as the on-axis sound pressure level which can be measured at a distance of 1 meter (39.36 inches) in front of a speaker which is being driven by 1 watt continuous average input power of a specified waveform. In the case of University products, we use band-limited pink noise, which is a good approximation of program material, and which provides thermal and mechanical stress that we feel best simulate "real-world" operating conditions for the speaker. Some manufacturers utilize swept or fixed-frequency sine waves, some utilize white noise with other than "pink" (6 dB/octave roll-off) shaping filters, and some calculate the 1 watt input based on actual driver impedance rather than nominal impedance, so not all manufacturers' sensitivity ratings can be compared directly.

Efficiency is a measure of the total acoustic power output by a speaker system relative to the total electrical power input to that system. Efficiency is difficult to measure, and it encompasses the sound output in all directions. Two speakers may have identical sensitivity, but different beamwidth; in this case, the speaker with the wider beamwidth will have greater efficiency. Generally, we are concerned with sensitivity when specifying speaker systems. Actual efficiency values, incidentally, all seem low due to the relative inefficiency of electrical watts-to-acoustic watts conversion (5% may be considered good).

The actual sound pressure level which a speaker system can deliver to an on-axis listener may be calculated from two specifications: sensitivity and power handling. For each doubling of the power above the 1 watt reference, the SPL at 1 meter will increase 3 dB (10 times the power will increase the SPL 10 dB). Therefore, if a speaker is rated at 100 dB SPL sensitivity (1 watt, 1 meter), and is capable of handling 100 watts continuous average power, then it should be capable of delivering a continuous SPL at 1 meter of 120 dB SPL. 100 dB at 1 watt becomes 110 dB at 10 watts (10 x 1 watt = +10 dB), and becomes 120 dB at 100 watts (10 x 10 watts = another +10 dB). This equation, however, does not account for power compression, which is a slight reduction in output that may occur as the voice coil heats up with higher power (therefore increasing resistance and decreasing power drawn from the amp), and as the coil moves through larger excursions (and therefore possibly into an area of less magnetic flux from the speaker magnet). Thus, the calculated maximum output SPL and actual maximum SPL may differ somewhat. University speaker systems, which have large voice coils and conservatively rated components, as well as low-loss crossover networks (where applicable) exhibit minimal power compression (hence greater efficiency).



Headroom as it relates to short- and long-term power handling

The "headroom" of a sound system refers to the difference, in dB, between the average sound level and the maximum (peak) sound level. Percussive and plucked string sounds often have short-term peak levels that are 10 to 20 dB higher than the average level. Since a peak of 20 dB requires 1000 times the average power, systems seldom are built with 20 dB of headroom, although a very high quality music reproduction system may be so designed. More commonly, music systems are built with 10 to 15 dB of headroom, and speech paging systems with 6 to 10 dB of headroom.

Fortunately, a system with 10 dB of headroom, based on calculations of continuous power amplifier and speaker system power ratings, will generally do a creditable job of reproducing 15 to 20 dB short-term peaks. Why? Because a plucked string, hammered piano note, or other transient-containing sound typically creates the very high transient level for only a few milliseconds. While University speaker systems (and components) are rated at continuous average power values, they typically have short-term (under 10 millisecond) power handling capability which may be 10 times as high (10 dB higher), during this relatively short, high-power burst, the voice coil will not heat up sufficiently to be damaged. Similarly, power amplifiers generally have power supply capacitors capable of delivering greater-than-average power for short periods, and the output transistors will not overheat when asked to deliver that power for a short period, so the amp may not clip during short-term peaks.

In order to properly design a system, you need to set realistic goals regarding peak and average levels, and to then select components capable of meeting those criteria reliably. Detailed University Sound data sheets are available on request and contain additional information useful for proper system design.

Line Radiators

Line Radiator Design Theory

Line Radiators

University Sound Line Radiators are important tools in many applications. Not just simple sound columns, their patented designs and special crossover networks make quality sound possible — inexpensively, with minimum feedback, in locations where communication is difficult.

Easy to install, the LRs fit the contours of most rooms while preserving the aesthetics. Their long slender shape makes these units unobtrusive, and they are easily painted when needed.

Line Radiators may be mounted vertically in most locations, providing even coverage throughout (sound dispersion for line radiators is 90° from the axis of the enclosure). LRs may also be mounted horizontally; this orientation is especially effective in long, narrow coverage areas and for distributed systems.

Column Design

The theory of how a column works is fascinating. If a speaker (for example, one with vertical dispersion of 120°) is placed adjacent to another identical speaker, on the same plane and as close as possible to it, the vertical dispersion is cut in half (60°), and the sound level (SPL) increases 6 dB. This compressed coverage pattern helps direct the sound to the listening area, and keeps it away from the ceiling and floors (Figure 1) without affecting the horizontal coverage angle (Figure 2). Add more speakers in the same line, and the vertical coverage narrows even more, while SPL increases. Ideally, then, the column can provide excellent coverage for the room (Figure 3).

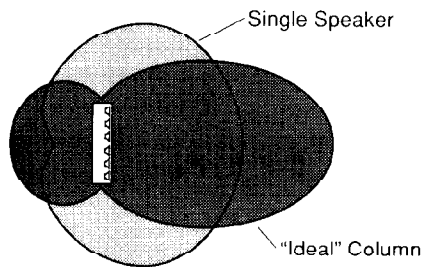


Figure 1

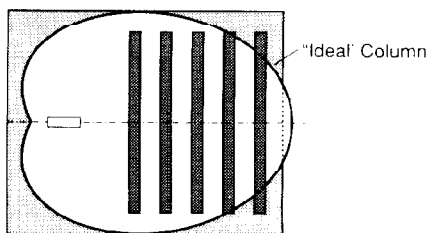


Figure 2

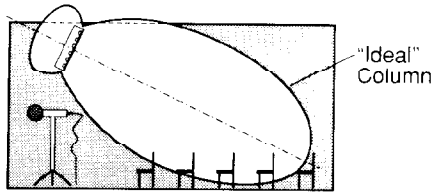


Figure 3

Unfortunately, a simple column is not a good design. Why? The column concept only works effectively throughout a very narrow part of the speaker's range, i.e., where the column's length is from 1/4 to one wavelength (usually below 2,000 Hz). As frequencies increase, shorter wavelengths occur, and many in the listening area find it difficult to understand speech (Figure 4). These lobing and beaming problems are even more pronounced at higher frequencies, providing good coverage (uniform frequency response) to only a few, randomly placed seats (Figure 5).

If the physical length of a column could be shortened as the frequency increases, then coverage could be uniform. However, this is physically impossible. Our engineers, however, came up with a major innovation to achieve the same basic result.

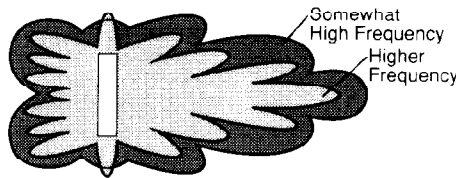


Figure 4

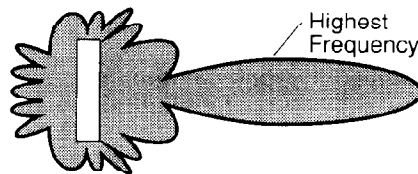


Figure 5

Changing the Column Length with Frequency

Many of the beaming and lobing problems inherent in conventional columns were solved when our engineers developed a patented crossover network for our Line Radiators. This network acoustically changes the length of the speaker system by turning the outer speakers off as the frequency increases. At the highest frequencies, which have the shortest wavelengths, only the center speaker operates. This is the basis of design in the LR4SA series (Figure 6) and LR2SA series

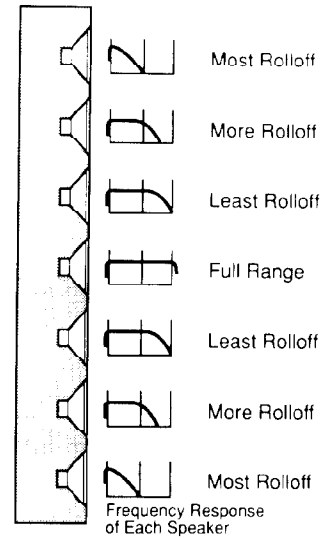


Figure 6

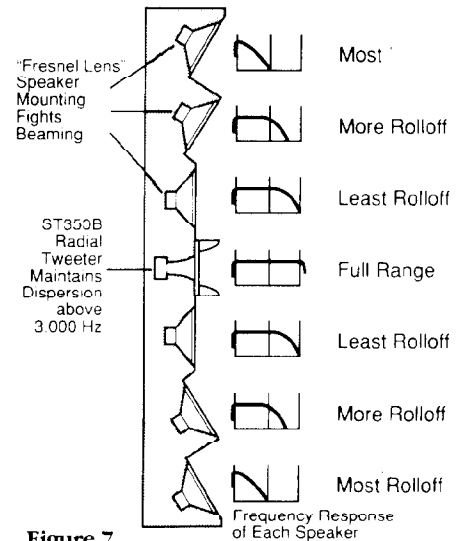
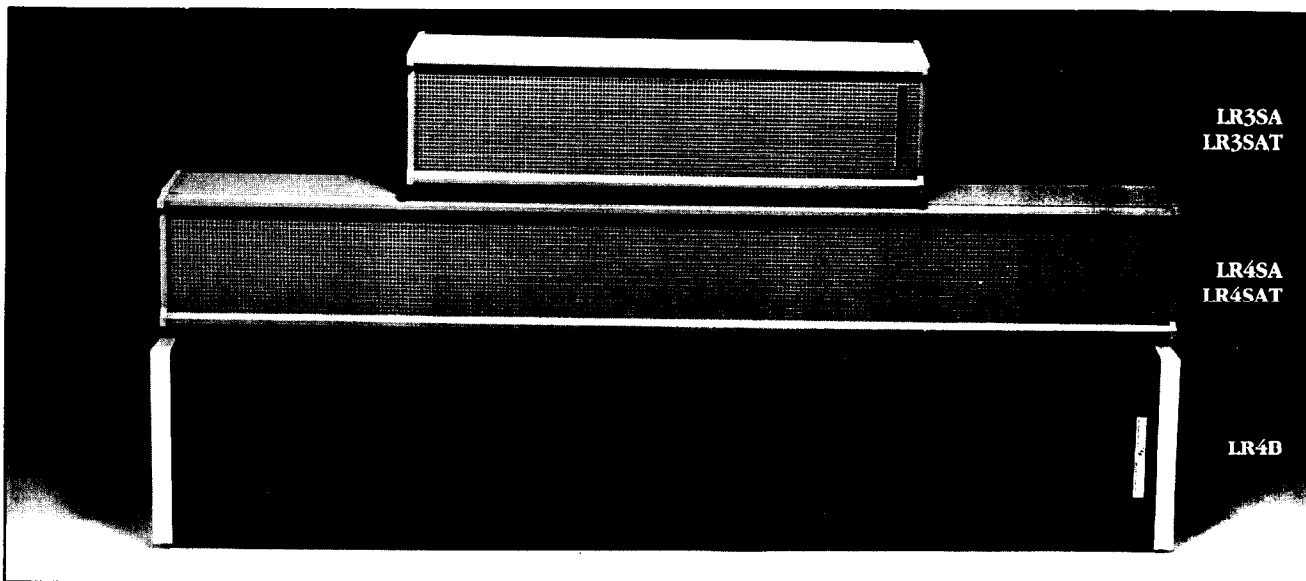


Figure 7

When the LR4SA was put into a curved enclosure, the lobing and beaming was reduced still further. To avoid the difficulties inherent in mounting a curved box, our engineers devised a unique "multi-facet" design that provides a curved column effect within a rectangular box (Figure 7).

The LR2SA, LR2SAT, LR4SA, LR4SAT and LR4B are presented in greater detail on the facing page.

LR2SA, LR2SAT, LR4SA, LR4SAT, LR4B Weather Line Radiators



- Unique design alters acoustic length with frequency*
- Unique LR4B “multi-facet” curved column/straight box system with CD HF Horn for wide dispersion & response
- Less lobing than conventional sound columns
- Perforated metal grilles with foam moisture shields
- Available with built-in, switchable-tap transformers for 25, 70.7 & 100 volt lines (“T” models)

LR2SA, LR2SAT

The LR2SA (12 ohm version) and LR2SAT (universal line transformer version) contain a vertical array of three 5 x 7-inch elliptical full-range drivers connected together with a patented network that effectively shortens the length of the line radiator with increasing frequency. The nominal dispersion angle (6 dB points) averaged in 1/3-octave bands of pink noise from 1 to 10 kHz is 100° H by 45° V. This system's wide frequency range and relatively high sensitivity, along with its 25 watt input capacity, further aid in solving difficult sound reinforcement problems. While elongated, the system is extremely compact (just 24.5 inches high), which makes it both easy to fit in tight spaces, and easy to conceal where aesthetics are critical. The LR2SA and LR2SAT have a fawn metallic finish on an extruded aluminum cabinet. The LR2SAT's transformer is weather resistant (encased in the speaker housing) and has seven screwdriver-adjustable power taps.

LR4SA, LR4SAT

The LR4SA (8 ohm version) and LR4SAT (universal line transformer version) contain a vertical array of six 5 x 7-inch elliptical full-range drivers with the same specialized network as the LR2SA series. The nominal dispersion angle from 1 to 10 kHz is 100° H by 35° V. The LR4SA systems deliver 10° narrower (median) vertical coverage, 4 dB greater on-axis sensitivity, and twice the power handling capacity (50 watts) of the smaller LR2SA systems. Design and finish is like that of the LR2SA, and the LR4SAT additionally includes a T-position adjustable transformer for matching 25, 70.7 or 100 volt lines.

LR4B

The LR4B uses a different approach to pattern control. A University ST350B constant directivity horn-loaded tweeter is installed in the center of the column to provide extended, wide-angle, high-frequency response. Because the output of the six 5 x 7-inch elliptical drivers is attenuated above the 3 kHz crossover point, the acoustic length of the column need not be shortened with frequency. However, we designed the LR4B with an internally curved “multi-facet” structure that improves pattern control and reduces lobing below the crossover frequency. The nominal dispersion angle from 1 to 16 kHz is 120° H by 60° V. The LR4B minimizes the problems of feedback, spotty coverage, and physical size that accompany alternative horn woofer speaker systems. Its enclosure is constructed of plywood and particle board, with a black finish. The LR4B is rated at 100 watts (8 ohms); an optional 25W / 70.7V line transformer is available.

SPECIFICATIONS	LR2SA/LR2SAT	LR4SA/LR4SAT	LR4B
Frequency Response	170 - 10k Hz, ±5 dB	160 - 10k Hz, ±5 dB	110 - 15k Hz, ±5 dB
Power Handling (EIA RS-426A)	25 watts	50 watts	100 watts
Sensitivity (1W, 1m, 300 - 2k Hz pink noise)	96 dB SPL	100 dB SPL	98 dB SPL
Dispersion†	100° H x 45° V	100° H x 35° V	120° H x 60° V
Directivity Factor (Ro)	9.5	9.3	6
Nominal Impedance	12 Ω (LR2SA)	8 Ω (LR4SA)	8 Ω
Dimensions: Height	24.5 (62.2)	48.4 (122.9)	48 (122)
Width	6.3 (16.0)	6.3 (16.0)	9.8 (24.8)
Depth	4.7 (11.9)	4.7 (11.9)	7.5 (19.0)
Net Weight: lb (kg)	11.0 (5.0)	21.5 (9.8)	40 (18)
Shipping Weight: lb (kg)	17.0 (7.7)	25.0 (11.4)	45 (20.4)

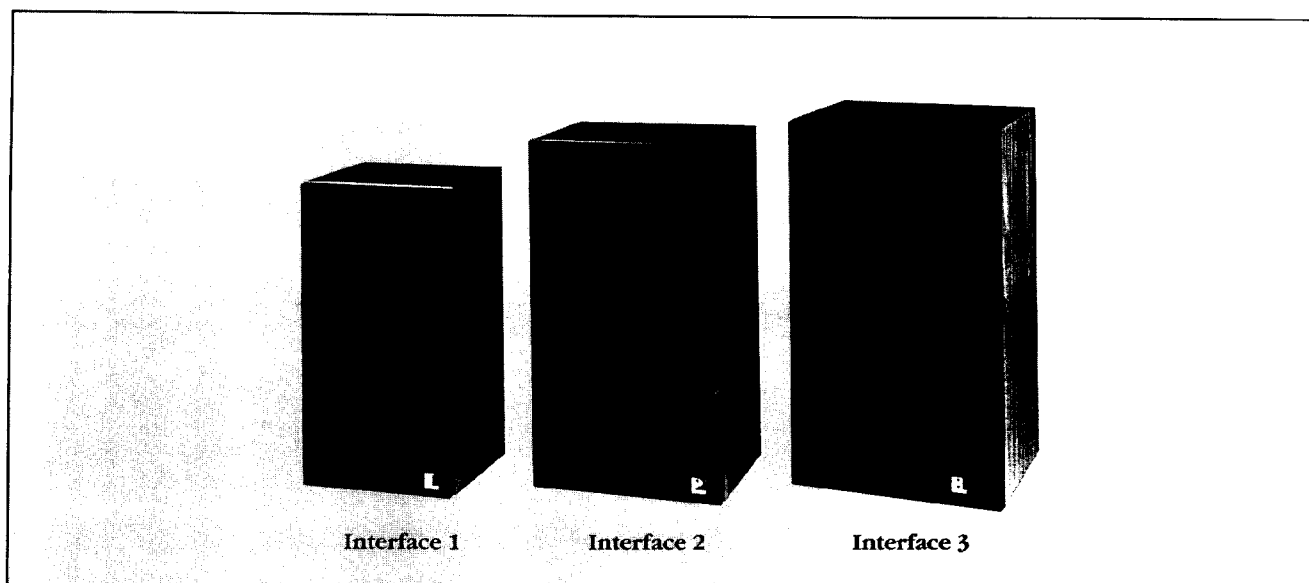
Note: Add approximately 1.5 pounds (0.7 kg) for transformer-equipped models.

*Excluding the LR4B

† This is the median of the nominal angle included between 6 dB-down points on polar responses, in 1/3 octave bands of pink noise from 1 to 10 kHz (1 to 16 kHz on LR4B).

Interface Series Speaker Systems

Interface 1, 2 & 3 Speaker Systems



- **Wide-range, high-quality 2-way systems for music**
- **8" Midrange/woofer, 1.5" super dome tweeter**
- **Thiele-optimized bass: vented enclosure on Interface 1, passive radiators on Interface 2 and Interface 3**
- **High sensitivity and 50 watt long-term power rating**

The Interface 1, 2 and 3 are popular, high-quality, wide-range speaker systems designed to reproduce music with true accuracy and low distortion. Simulated walnut-grained vinyl gives these systems an elegant appearance. Sound consultants and engineers now have efficient, dependable speaker systems that can be specified with confidence in lounges, corporate board rooms, and other intimate locations.

Each Interface* system uses an impressive 8-inch midrange woofer, and a Super Dome™ tweeter, in a scientifically designed "optimally vented" enclosure based on the theories and proven technology originated by the Australian scientist A. N. Thiele. The 6th order Butterworth tuning reduces cone excursion (for lower distortion) and provides deeper, more powerful bass response than would otherwise be possible in a relatively small enclosure.

All three models include an active equalizer that boosts LF output, sharply filters infrasonic sound, and permits HF contouring without altering crossover performance. The three models offer substantially the same sound quality, efficiency, dispersion, and power handling capacity; they differ primarily in physical size and low frequency cutoff.

Interface 1

The lowest octave (approximately) of this system's bass response is reproduced by a vent. As the frequency lowers, the excursion of the 8-inch woofer/midrange actually decreases since a relatively small movement is required to drive the vent to full output. This is the mechanism whereby the Interface series delivers 6 dB higher bass effect and lower distortion than ordinary acoustic suspension speakers. Therefore, more power amplifiers may be employed, providing a real cost savings. The Interface 1 is the most compact of the three models, though all models have the same high sensitivity and power ratings.

Interface 2

The slightly larger Interface 2 utilizes a 12-inch diameter passive low frequency radiator in place of the vent in the Interface 1. The larger enclosure volume, and the tuning of this passive radiator, extend the Interface 2's effective low frequency output some 9 Hz below the Interface 1.

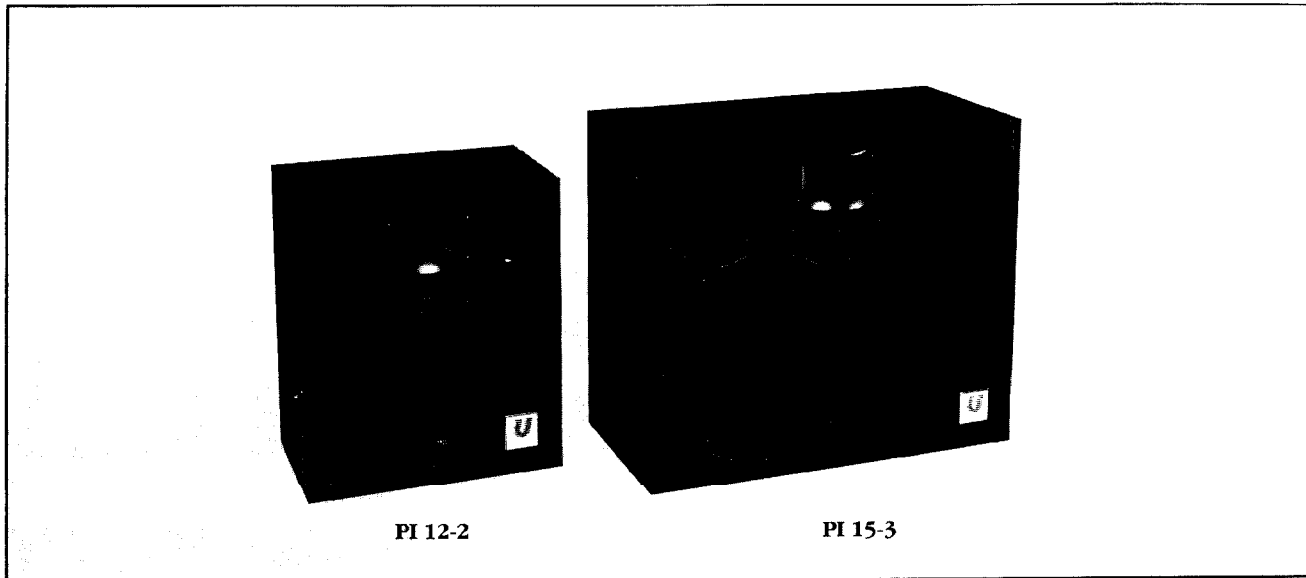
Interface 3

This model is nearly identical to the Interface 2, but again with a slightly larger enclosure and a 12-inch diameter passive radiator. Low frequency response is therefore extended further by 9 Hz below the Interface 2.

SPECIFICATIONS	Interface 1	Interface 2	Interface 3
Frequency Response	65 - 18k Hz, ±5 dB	56 - 18k Hz, ±5 dB	47 - 18k Hz, ±5 dB
Power Handling (EIA RS-426A)	50 watts	50 watts	50 watts
Sensitivity (1W, 1m, 500 - 5k Hz pink noise)	92 dB SPL	92 dB SPL	92 dB SPL
Beamwidth (@ 2 kHz)	157° H x 100° V	100° H x 107° V	105° H x 150° V
Directivity Factor (D ₀) @ 2kHz	2.2	5.	5.5
Nominal Impedance	8 Ω	8 Ω	8 Ω
Dimensions:			
Height	11.4 (28.9)	13.8 (34.9)	14.8 (37.5)
Width	21.3 (54.0)	21.3 (54.0)	25.3 (64.1)
Depth	9.7 (24.6)	10.7 (27.1)	13.1 (33.3)
Net Weight: lb (kg)	23.0 (10.4)	25.0 (11.3)	33.0 (15.0)
Shipping Weight: lb (kg)	29.0 (13.2)	31 (14.1)	39 (17.7)

Permanent Installation Speaker Systems

PI 12-2 & PI 15-3 Speaker Systems



PI 12-2

PI 15-3

- **Wide-range, high-sensitivity systems for voice or music**
- **2-Way design, 12" woofer & compression tweeter (12-2)**
- **3-Way design, 15" woofer, 6.5" vented midrange cone midrange driver & compression tweeter (15-3)**
- **Thiele-optimized vented cabinets for low distortion and high bass output**
- **Constant-directivity tweeter with auto-limiting protection circuit**

The PI 12-2 and PI 15-3 are rugged, reliable, highly-efficient, wide-angle systems designed for permanent installation indoors. They should be used where the directivity of a Line Radiator is not required. They are useful as the main speakers in skating rinks, lounges or small auditoriums, or sidefill monitors in theatrical and entertainment systems.

Each system employs a high-power-capacity, maximum-efficiency, low-frequency loudspeaker, as well as an ST350B compression tweeter. The tweeter is protected by an auto-limiting circuit, and offers constant 120° horizontal dispersion across its entire operating range for uniform frequency response throughout the coverage area.

The enclosures are constructed of black vinyl-covered particle board. Both models are rated at 100 watts, with an 8-ohm input impedance. Optional matching transformers for 25 or 70.7 volt lines are available.

PI 12-2

This is a compact, 2-way system rated at 97 dB input sensitivity, and having nominal 60° H x 65° V dispersion at 2 kHz. The PI 12-2 frequency response is 75 - 16k Hz (±5 dB), with useable output to 50 Hz.

PI 15-3

This compact, 3-way system is rated at 98 dB input sensitivity, and has nominal 90° H x 105° V dispersion at 2 kHz. The PI 15-3 frequency response goes down 25 Hz lower than the slightly smaller PI 12-2 (to 50 Hz) and its useable output extends 10 Hz lower to 40 Hz. The PI 15-3 utilizes our exclusive VMR™ vented midrange speaker. It is the only cone midrange driver available which not only matches the high sound pressure levels available from the Thiele-optimized bass cabinet, but it also complements the uniform dispersion of the ST350B C-D compression tweeter. The result is a redefinition of the clarity and natural sound quality possible in a complete, full-range speaker system.

The Vented Midrange

The optimally vented midrange (VMR™) used in the PI 15-3 provides the efficiency of a horn midrange driver without the "honky" sound typical of many horns. The 6.5" diameter cone driver offers superior midrange dispersion for outstanding lateral and front-to-back sound localization. The vent action permits unusually low crossover frequencies, keeping vocal performances free of low-frequency intermodulation.

SPECIFICATIONS	PI 12-2	PI 15-3
Frequency Response	75 - 16k Hz, ±5 dB	50 - 16k Hz, ±5 dB
Power Handling (EIA RS-426A)	100 watts	100 watts
Sensitivity (1W, 1m, 500 - 5k Hz pink noise)	97dB SPL	98 dB SPL
Beamwidth (@ 2 kHz)	60° H x 65° V	90° H x 105° V
Directivity Factor (D _o) @ 2kHz	12.7	7.0
Nominal Impedance	8 Ω	8 Ω
Drivers	12" woofer midrange ST350B compression tweeter	15" woofer 6.5" VMR™ vented midrange ST350B compression tweeter
Crossover Frequency	3 kHz	500 Hz, 4 kHz
Height	21.0 (53.3)	24.5 (61.6)
Width	18.3 (46.4)	28.0 (71.1)
Depth	11.5 (29.2)	13.7 (34.7)
Net Weight: lb (kg)	62.0 (28.2)	102.5 (46.6)
Shipping Weight: lb (kg)	66.0 (29.9)	108.0 (49.0)

Component Products

Introduction

University offers several full-range, raw-frame loudspeakers that are suitable for use in distributed sound systems, including the CS410, CS810, MC8A, MC12A, SP8C and SP12C. These units are all 8 ohm rated, though optional line matching transformers for 25 or 70.7 volt lines may be added. Three additional models, the CS410T, CS810T, and CS810TWB include built-in transformers.

All models, except the SP8CS and SP12C, can be mounted in standard ceiling speaker baffles, and will accommodate the use of any standard back enclosure of suitable size. Larger back volumes, however, will increase the lower frequency output. The SP8C and SP12C should be mounted in a vented enclosure (box volume, tuning data and construction suggestions are included on the data sheet). While the SP8C and SP12C may be used as full-range reproducers, they also work well as midrange/woofers in conjunction with a crossover and a separate tweeter for the highest frequencies.

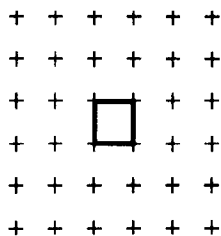
The Concept of Ceiling Speakers

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.

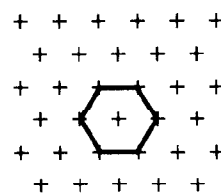
Even Coverage vs. Cost

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 shown in Figure 1. 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.



SQUARE SPACING:



For each of the patterns, a choice should be made as to the amount of overlap. These are illustrated in Figure 1 as (1) edge-to-edge, (2) minimum overlap, and (3) center-to-center. There will be maximum and minimum SPL (relative to the on-axis SPL for a single speaker), and the difference between SPL_{max} and SPL_{min} gives an indication of the quality of the installation. Table 1 shows typical values for the six basic patterns. A 2 dB (or less) variation in SPL will be virtually imperceptible, whereas a 6 dB variation might be significant – though perhaps adequate for many installations. The installer needs to make a cost vs. quality-of-coverage decision.

Referring to Figure 2, the radius 'r' of the coverage circle is calculated by 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 (affected by whether the audience is seating or standing).

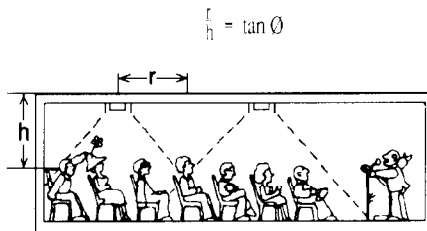
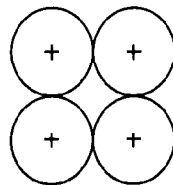


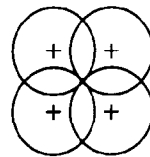
Figure 2. The radius 'r' of the coverage circle in a distributed speaker system.

Speaker Pattern	L_{max} (dB)	L_{min} (dB)	$L_{max} - L_{min}$ (dB)
Square Edge-to-Edge	0.66	-3.99	4.35
Hexagonal Edge-to-Edge	0.95	-4.45	5.40
Square Minimum	2.02	-0.32	2.04
Hexagonal Minimum	1.36	-1.73	2.50
Square Center-to-Center	5.17	3.78	1.39
Hexagonal Center-to-Center	5.38	4.21	1.17

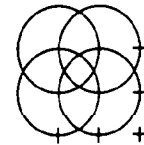
Table 1. SPL changes for various patterns relative to on-axis value for a single speaker.



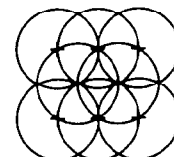
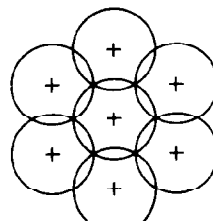
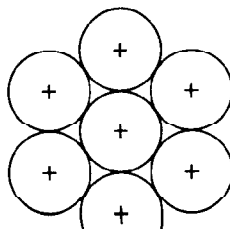
1) Edge-to-Edge



2) Minimum



3) Center-to-Center



Example

The CS810s to be used in an installation requiring speech reinforcement, so an upper frequency limit of 4 kHz is selected. θ is 6 feet. An examination of the beamwidth curve on the CS810 data sheet shows us that $\theta = 45^\circ$.

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

Adequate Headroom

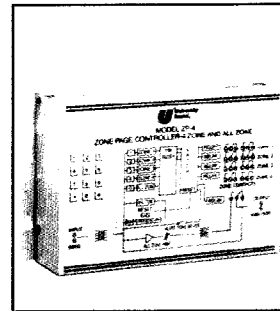
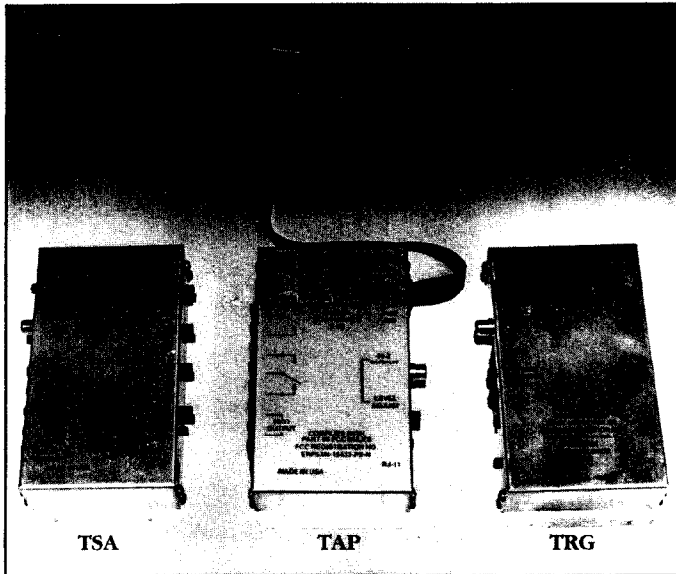
Speakers used in distributed systems almost always use matching transformers in order to economically distribute amplifier power to each loudspeaker. It is a simple matter to choose the appropriate transformer tap based upon the average SPL desired, the loudspeaker sensitivity, and the distance between 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 in order to avoid excess distortion on peaks.

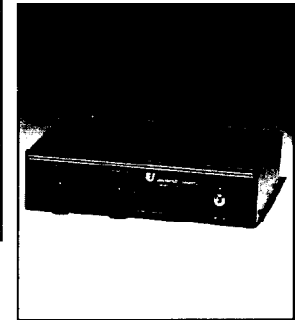
Summary

You can see that University is concerned about the proper use and installation of our products. We provide you with the necessary information for you to plan, system, and to know that you will achieve the desired results. Polar plots, beamwidth plots and/or directivity graphs are given on all loudspeaker data sheets. Information similar to the distributed pattern charts presented here, but even more detailed, is available for our horn-loaded loudspeakers and speaker systems, in the form of our VAMP* and Easy-VAMP techniques (VAMP is an acronym for Very Accurate Mapping Program).

VOX-15, ACR-1, TLA-25, TLA-70, TL-600, TM-2, TM-2P, TT-4A, TRG, TSA, TAP, ZP-4 Telephone Interconnect Equipment & Accessories



ZP-4



VOX-15



- VOX-15 talkback amp for hands-free intercom
- ACR-1 audio controlled relay for telephone paging
- TLA-25, TLA-70 telephone line adaptor transformers
- TL-600 600Ω/300Ω/150Ω line matching transformer
- TM-2, TM-2P, TT-4A telephone input transformers
- TRG telephone ringing generator for paging of bell*
- TSA telephone station access paging adaptor*
- TAP telephone trunk access paging adaptor*
- ZP-4 zone page controller drives 4 zones from 1

The VOX-15 is a paging amplifier with a voice-activated relay. Combined with a speaker system, it can be used for hands-free talkback. The VOX-15 is recommended for locations where 2 way communication is needed but telephone instruments aren't practical, i.e., warehouses, shipping rooms, auto/machine shops, etc. - although it should be used only in areas with low ambient noise levels. The input is from a telephone PABX or switchboard connection (with "dial access" or "com line access" function). The output is 15 watts, designed for 25V speaker lines or direct connection to loudspeakers with a load impedance of 32Ω to 48Ω. Horn-type speakers deliver the best results. There are separate controls for the speaker and phone volume. A delay circuit keeps the relay activated during brief pauses in conversation. This shelf-mount unit may be installed in a rack with the RPK-6 adaptor kit.

The ACR-1 is an audio controlled relay that provides input to amplifiers or receivers from telephone paging sources (or from any 600Ω audio signal source). It is ideal for use with electronic key systems where no contact closure is provided for paging access; the ACR-1 then becomes the switch when music mute, selective paging, or zone paging is required. This compact unit can be mounted almost anywhere, is 120V AC powered (5W), and is UL approved.

The TLA-25 and TLA-70 are telephone line adaptor transformers which match 25 volt or 70.7 volt speaker lines (respectively) or amplifier outputs to 500Ω or 600Ω lines or leased phone lines for the transmission of music and/or paging signals. These units also may be used to match the speaker line to the aux input of a booster amp, thereby permitting a given music/paging system to be expanded. The units are housed in compact metal boxes.

The TL-600 is a 600Ω:600Ω audio isolation transformer with one split winding. Either side may be used as primary, so the unit can match a 600Ω circuit to two 300Ω circuits, a 600Ω circuit to a 150Ω circuit, or it can simply isolate two 600Ω circuits from one another. It is housed in a compact metal box.

The TM-2, TM-2P and TT-4A are telephone input transformers. The TM-2 is housed in a compact metal box and matches a 600Ω telephone line (from a switchboard, dial-access phone, or internal phone system) so it can serve as the paging input to an amplifier or receiver. The unit has two outputs so it can be used to drive a mic or aux input. The TM-2P is identical to the TM-2, but has only a high-level (aux) output with screwdriver-adjustable level control. The TT-4A is the same as the TM-2, but is an octal plug-in package for use with the 806-35W, 1808-60A, 1810-100A and 1811-100 amplifiers.

The TRG is telephone ringing generator which produces a bell-like warble tone (audio signal) when activated by a ringing voltage on a telephone line. The unit is powered by the phone line and requires no other power source. By connecting the TRG output to a paging system's audio line input, the paging loudspeakers serve as the telephone ringer. A standard modular jack is provided for the phone line input, and there are two outputs: a high-Z, 1-volt RCA pin jack and screw terminals for 600Ω, +4 dBm connection. The high-Z output has a level control, and the ringing tone pitch is adjustable from 480/600Hz to 1000/250Hz (repetition rate varies in proportion to tone pitch, from 4.5 to 9 Hz). The TRG is housed in a compact metal case.

The TSA is a telephone station adaptor that facilitates dial-up access from a PABX to a paging amplifier. It has a standard modular phone jack input, and power is derived from the phone line. The unit simply connects to a dedicated station line in place of a telephone instrument. Then, by calling the station number to which the TSA is connected, a party obtains direct access to the paging system. When the connection is made, the TSA sounds an alert tone in both the phone and the paging loudspeakers. After the page, the TSA automatically disconnects either when dial tone is heard, or after a preset time limit, whichever comes first. The TRG has the same low-Z and high-Z outputs as the TRG, plus a DPDT relay for activation of music mute or other functions during paging. Controls are provided for adjustment of the Alert Tone Level, Paging Access Time, Dial Tone Sensitivity, and Dial Tone Trip Time.

The TAP is a trunk access paging adaptor that facilitates access to a paging system from a telephone loop circuit such as a central office trunk (Centrex), PABX, or PBN - as well as from rotary or touch-tone telephone instruments. The unit includes a built-in power supply for "talk battery," a DPDT relay to indicate loop current, and an audio isolation transformer to couple the phone signal to a paging amp. Modular phone input, low-Z/high-Z output, and relay connections are like the TSA. The TAP requires 120V AC.

The ZP-4 zone page controller converts a single-port 600Ω telephone paging output to drive any or all of four different zones, as selected by standard DTMF tones from the touch pad on the phone used as the paging source. The unit has four DPDT relays (1 per zone) and their outputs may be connected to switch either amplifier inputs or outputs. The audio input and outputs are 600Ω transformer-balanced. The circuit provides for 1-way or 2-way paging. In "all zone" mode the transformer output is amplified to obtain the 150Ω source necessary to drive all three zones, in which case there is 1-way paging (no talkback). A page is automatically terminated by a dial tone, or from 4 to 30 seconds after the voice-activated circuit no longer senses any input; ambient line noise and dial tones are automatically muted when not paging. The unit is housed in a wall-mountable metal case and uses 120V AC or 24V DC power.

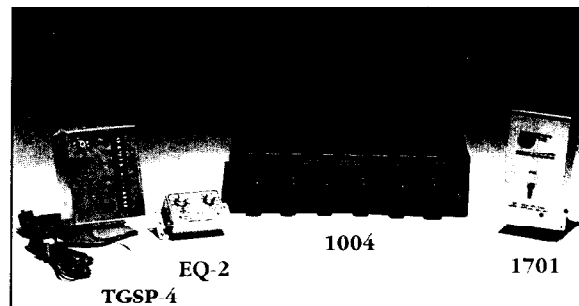
* FCC registered

See Specification Chart on Page 48

Accessories

1701, 1702, 703, 1004, 1802, EQ-2, TGSP-4, DLT, MDT, RSP-1 Installation Accessories and Amplifiers

- 1701 1-watt wall-mount utility amp, unbalanced line in
- 1702 1-watt wall-mount utility amp, balanced line in
- 703 1-watt wall-mount amp, switchable:
balanced low-Z / unbalanced high-Z mic in
- 1004 5-input, shelf/rack-mount, preamp/mixer
- 1802 4-input, shelf/rack-mount, mic/line preamp/mixer
- EQ-2 passive bass & treble tone control module
- TGSP-4 self-powered tone generator
- DLT & MDT 10k Ω , 1:1 distribution line transformers
- RSP-1 self-powered selective paging relay



The 1701 and 1702 are nearly identical 1 watt utility amplifiers with one input, a level control, and two mono outputs: 8 Ω unbalanced 1 watt and 500 Ω transformer-balanced +4 dBm. As such they are suitable for driving a monitor loudspeaker, headphones, a telephone line, or for Music-on-Hold. The 1701 has an unbalanced, high-Z line input (47k Ω , 60 mV), whereas the 1702 has a transformer-balanced low-Z line input (10k Ω). Controls and terminals are on the front, and these compact units can be mounted on a wall, below a shelf, in a cabinet, or almost anywhere that is convenient. They operate from 120V AC, 50/60 Hz mains, and the power pack is UL listed.

The 703 is similar to the 1701 and 1702 except it has a microphone input instead of a line input. The mic input can be switched between low-Z balanced or high-Z unbalanced operation to accommodate most dynamic mics. The power pack is UL listed.

The 1004 is a mixer/preamplifier that can combine up to 5 input sources, each with a discrete level control, into a mono output with its own master control. The 1004 has four mic input channels plus an aux line input. The mic inputs have 3-pin XLR-type connectors for low-Z balanced mics, as well as 1/4" phone jacks for high-Z unbalanced mics.

The auxiliary input (which can accommodate a music source) includes an automatic muting feature to mute music when paging. Mic channels 1 & 2 have balanced bridge-line terminals as an input option. Mic channels 3 & 4 have unbalanced aux connectors as an input option. Three separate output connections are provided for compatibility with the input of almost any amplifier or an additional mixer: high-Z unbalanced aux, high-Z unbalanced mic, and low-Z balanced mic. The unit may be powered from 120V AC or 24V DC, and mounts on a shelf or (with optional kit) in a 19" standard equipment rack.

The 1802 is a four-input preamp/mixer which allows selection of three input configurations: (a) 4 mics, (b) 3 mics and 1 aux line input, or (c) 2 mics and 2 aux line inputs. Each input has its own level control. The mic inputs are switch-selectable for unbalanced high-Z or low-Z operation. The auxiliary inputs will accept the line output of tuners, tape

decks, hi-fi preamps, and even crystal phono cartridges. The maximum output level is 6V (high-Z). Two or three 1802's can be paralleled into an external amp input, expanding the capability of the system to a maximum of 12 input sources. The 1802 is shelf-mountable or, with an optional kit, can be mounted in a 19" rack. An isolated ground system avoids "ground loops" if multiple units are mounted in the same equipment rack.

The EQ-2 is a passive, 2-band audio equalizer providing ± 12 dB of shelving adjustment at 50 Hz and 15 kHz (700 Hz turnover frequency). The unit has 12 dB insertion loss, and should be used with ± 7 k Ω or less source Z and ± 7 k Ω or greater load Z. The controls are screwdriver-adjustable, and RCA pin jacks at either end of the compact case handle input and output. The EQ-2 may be used to improve the sound of SCA tuners, tape decks, wired music, and general signal transmission.

The TGSP-4 is a self-powered tone generator that provides signaling or annunciation for a sound system. In single-strike installation mode, it produces a chime note when an external switch or relay circuit is closed. In repeat installation mode, it provides a choice of a repeating chime note, steady tone, or siren; the siren has top priority, tone second, and chime third. The output level and tone frequency are adjustable.

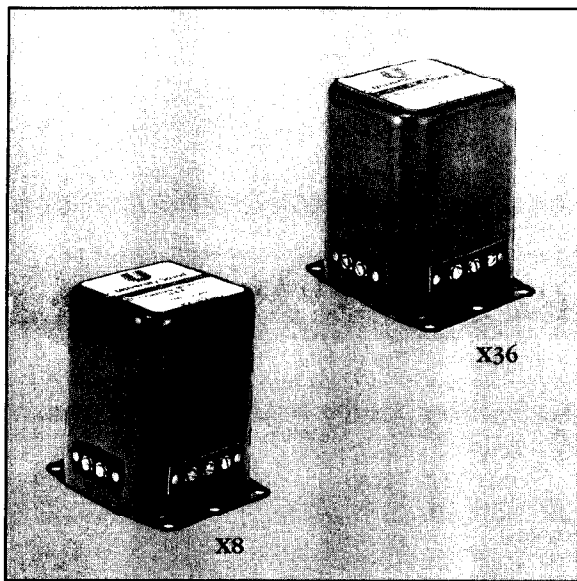
The DLT is a distribution line transformer with 1:1 input/output ratio and 10k Ω input and output impedance. It can be used for isolation, thereby helping to avoid ground loops in multiple-amplifier background music systems. The DLT can be used to connect up to 20 high-Z amplifier inputs from a single 500 Ω or 600 Ω distribution line. The DLT is housed in a compact, sturdy metal case.

The MDT distribution line transformer is identical to the DLT, but also includes an output level adjustment.

The RSP-1 is a self-powered selective paging relay. It can be used to achieve selective, priority or zone paging in sound systems. A DPDT relay with precious metal contacts (for long life and reliability) is contained in a sturdy metal box with convenient screw-terminal connections (two for coil actuation, six switched contacts). An arc suppression diode reduces inductive kickback voltage in the relay coil, preventing startup pops or clicks

1701, 1702, & 703 spec'd on page 48.	1004	1802	EQ2	TSGP-4	DLT/MDT	RSP-1
Frequency Response (+2 dB)	30 Hz - 20 kHz	25 Hz - 17.5 kHz	EQ: 700 Hz knee; +12 dB @ 50 & 15k Hz	N/A	20 Hz - 20 kHz*	N/A
Input(s)	Hi-Z unbal &/or Lo-Z bal mic x 4 & Hi-Z unbal aux	4x mic or 2x mic/ 2x aux; Hi-/Lo-Z, unbalanced	17V/47k Ω (12 dB insertion loss) RCA conn.	Screw terminals for switch closure.	10k Ω actual Z, for 500 Ω lines RCA conn.	Coil: 24V DC @ 50mA contacts, DPDT (two form C)
Output(s)	125mV/47k Ω mic 10mV/150 Ω mic 4V/47k Ω (Aux)	High-level aux & mic level (unbal, high Z)	47k Ω RCA connector	2V max 50k Ω unbal. RCA conn. & screw term.	10k Ω source Z, for 500 Ω lines RCA conn.	3A contacts
Other Info/Notes	Uses RPK-6	Uses RPK-4, 4V @ 0.2% THD output	Max 50V DC input.	600 - 1300 Hz tone; UL listed	* @ 0 dBm. MDT has level control	Has 120 V AC input for DC coil power
Dimensions:						
<i>Inches</i> Height	3.125 (79.4)	3.125 (79.4)	1.000 (25.4)	2.500 (63.5)	1.000 (25.4)	2.250 (57.1)
<i>(mm)</i> Width	12.375 (314)	9.500 (241)	3.875 (98.4)	5.125 (130)	3.875 (98.4)	5.125 (130)
Depth	8.250 (210)	7.000 (178)	2.000 (50.1)	3.500 (88.9)	2.000 (50.1)	3.500 (88.9)
Weight		7 lbs. (3.2kg)	1 lb. (0.45kg)	1 lb. (0.45kg)	1 lb. (0.45kg)	2 lbs. (0.9kg)
Power Requirements	120V, 60 Hz, 0.03A 24-27V DC, 0.1A	120V, 60 Hz, 5 W	Passive	120V, 60 Hz, 5 W	Passive	120V, 60 Hz, 5W

SMH-1, STR, X8, X36 Speaker Component Loudspeakers



SMH-1 Speaker mounting hardware kit

The SMH-1 Speaker Mounting Kit consists of four die cast zinc alloy speaker mounting clamps, finished in black enamel, four 1/4-20 x 1" combination slotted hex washer-head machine screws, and four 1/4-20 T-nuts. These clamps and T-nuts are designed to facilitate both initial mounting and subsequent change of a variety of speakers having rim thickness of approximately 0.4" (10 mm), including the SP8C and SP12C. Using the supplied screws, panel thickness slightly over one inch can be accommodated; 1/4-20 machine screws may be used for thicker panels. The T-nuts will accommodate panel thickness down to about 1/4". Changing a speaker does not require complete removal of screws; the clamps may be loosened and turned sideways.

STR Tweeter protector

The STR is made to prevent damage to a compression driver or compression tweeter. A relay disconnects the driver when long-term (over 10 ms) energy exceeds an adjustable threshold level energy below 3,500 Hz is weighted to trip the protector more quickly than HF energy. A simple field-installable modification enables the unit to be used with lower-frequency cutoffs in such drivers as the 1829, and to drop the level about 6 dB instead of completely disconnecting the driver.

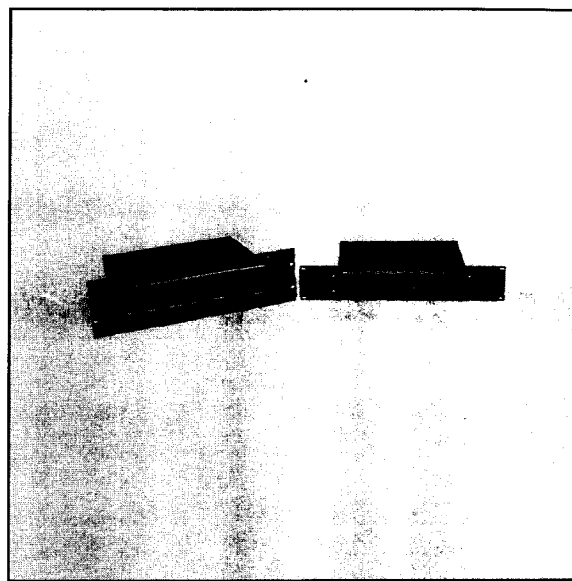
X8, X36 800 & 3500 Hz passive crossover networks

The X8 and X36 are high-Q, low insertion loss, frequency dividing networks designed for use in loudspeaker systems having an 8-ohm characteristic impedance. Their constant-K configuration enables identical component values to be used both in series and shunt arms, thus ensuring identical characteristics on either side of the crossover frequency. With high-Q air-core inductors, the filter characteristics are maintained constant despite changes in average values of program level. The 800 Hz X8 and 3,500 Hz X36 are both rated at 100 watts continuous average sine wave power, with a 12 dB octave slope rate. The units may be cascaded to create a crossover network for a 3-way loudspeaker system. Though designed for use in 8-ohm systems, they may be used with 16-ohm drivers.

The X8 and X36 high frequency outputs exhibit no insertion loss; the low frequency outputs exhibit 0.75 dB and 0.5 dB loss respectively. The units measure 4.5" (11.4 cm) W x 3.6" (9.2 cm) D, and 4.8" x (12.1 cm) H for the X8 or 3.5" (8.9 cm) H for the X36. The net weight is 4 lb (1.8 kg) for the X8, or 1.5 lb (0.7 kg) for the X36. They are packaged in

black-painted steel cases and may be internally or mounted external to a loudspeaker enclosure.

RM-3/10, RPK-2 ~ RPK-6, CRMB-931 Rack Mount Kits



- For use with University electronic equipment
- Adapt various shelf-mount units to fit in a standard 19" EIA equipment rack
- Finishes match University equipment
- Includes rack mount screws and dress washers

The **RM-3/10** attaches to the side panels of the University Sound MA-355, MR-355, MA-605 or MA-1005. The RM-3/10 complements the appearance of these shelf-mount units and readily converts them to fit perfectly into a standard 19" wide equipment rack. No rear bracing is required in fixed installations. The RM-3/10 shipping weight is 4 pounds (1.8 kg).

The **RPK-5** is similar to the RM-3/10, and screws into the sides of the 1808-00A, 1810-100A or 1811-100 amplifiers. The bracket mounts measure 3.5" high (89mm), and the shipping weight is 2 pounds (0.9 kg).

The **RPK-2**, **RPK-4** and **RPK-6** are different style rack mount adaptors which not only include side-mount brackets, but also include face-plates which screw into the face of the equipment. The face plates are cut out to fit around the raised bezel on the front of the units to which they mount. The RPK-2 fits the 1800-40, 1801-40, 1834-20, 1870-20 and 1873-40. The panel measures 5.25" x 19" (133mm x 483mm) and shipping weight is 2 pounds (0.9 kg). The RPK-4 fits the 1798-10, 1820 and 1822. It measures 3.5" x 19" (89mm x 483mm) and the shipping weight is 2 pounds (0.9 kg). The RPK-6 fits the 1829-15A, 1004 and VOX15. It has the same overall dimensions and weight as the RPK-4.

The **CRMB-931** consists of two brackets (ears) to mount the 9006 or 9012 chassis in a standard 19" rack. The bracket mounts measure 5.25" high (133mm), and shipping weight is 2 pounds (0.9 kg).

University sound accessories are of the highest quality. They are built to be reliable in the most demanding applications, and, naturally, they complement the other products listed in this catalog (although they are useable with other manufacturers' equipment, too). Complete your installation professionally with the benefit of these useful accessories.

Electronics Specification Charts

Wall-Mount Amplifiers

	806-35W	1100	1120	1140	1160	1110
Power Output	35 watts	10 watts	20 watts	40 watts	60 watts	100 watts
THD @ Rated Output	< 2.0% @ 1 kHz	< 1.5% @ 1 kHz	< 1.5% @ 1 kHz	< 1.5% @ 1 kHz	< 1.5% @ 1 kHz	< 1.5% @ 1 kHz
Frequency Response (±2 dB)						
Overall	50 Hz – 15 kHz	50 Hz – 20 kHz	50 Hz – 20 kHz	50 Hz – 20 kHz	50 Hz – 20 kHz	50 Hz – 20 kHz
Aux Input	N/A	50 Hz – 20 kHz	50 Hz – 20 kHz	50 Hz – 20 kHz	50 Hz – 20 kHz	50 Hz – 20 kHz
Phone Input	N/A	400 Hz – 6 kHz	400 Hz – 6 kHz	400 Hz – 6 kHz	400 Hz – 6 kHz	400 Hz – 6 kHz
Mic Input	N/A	70 Hz – 20 kHz	70 Hz – 20 kHz	70 Hz – 20 kHz	70 Hz – 20 kHz	70 Hz – 20 kHz
Music Input	N/A	20 Hz – 20 kHz	20 Hz – 20 kHz	20 Hz – 20 kHz	20 Hz – 20 kHz	20 Hz – 20 kHz
Line Input	N/A	N/A	70 Hz – 20 kHz	70 Hz – 20 kHz	70 Hz – 20 kHz	70 Hz – 20 kHz
Tone Controls						
Bass	N/A	N/A	± 12 dB @ 50 Hz	± 12 dB @ 50 Hz	± 12 dB @ 50 Hz	± 12 dB @ 50 Hz
Treble	-20 dB @ 10kHz	-20 dB @ 10kHz	± 13 dB @ 15kHz	± 13 dB @ 15kHz	± 13 dB @ 15kHz	± 13 dB @ 15kHz
Signal-to-Noise Ratio						
Aux Input	N/A	70 dB	70 dB	70 dB	70 dB	70 dB
Phone Input	N/A	71 dB	71 dB	71 dB	71 dB	71 dB
Mic Input	65 dB	58 dB	58 dB	58 dB	58 dB	58 dB
Music Input	70 dB	71 dB	71 dB	71 dB	71 dB	71 dB
Line Input	N/A	N/A	58 dB	58 dB	58 dB	58 dB
Input Sensitivity/Impedance						
Mic	0.5mV/2k Ω or 5mV/47k Ω or 50mV/600 Ω	0.5mV/2k Ω	0.5mV/2k Ω	0.5mV/2k Ω	0.7mV/2k Ω	0.7mV/2k Ω
Aux Input	N/A	220mV/250k Ω	220mV/250k Ω	220mV/250k Ω	340mV/250k Ω	340mV/250k Ω
Phone Input	N/A	50mV/600 Ω	50mV/600 Ω	50mV/600 Ω	70mV/600 Ω	70mV/600 Ω
Music Input	300mV/200k Ω	220mV/200k Ω	220mV/200k Ω	220mV/200k Ω	280mV/200k Ω	280mV/200k Ω
Line Input	N/A	N/A	50mV/10k Ω	50mV/10k Ω	70mV/10k Ω	70mV/10k Ω
Outputs	4 Ω and 8 Ω 25V, 70.7V Interlock	4 Ω and 8 Ω 25V, 70.7V Booster Amp	4 Ω and 8 Ω 25V, 70.7V Booster Amp	4 Ω and 8 Ω 25V, 70.7V Booster Amp	4 Ω and 8 Ω 25V, 70.7V Booster Amp	4 Ω and 8 Ω 25V, 70.7V Booster Amp
Music Mute	30 dB	30 dB	30 dB	30 dB	30 dB	30 dB
Protection	AC Ckt Breaker Trumpet Protect	Internal Thermal Breaker	AC Ckt Breaker Trumpet Protect	AC Ckt Breaker Trumpet Protect	AC Ckt Breaker Trumpet Protect	AC Ckt Breaker Trumpet Protect
Dimensions						
Height	12.000 in. (305mm)	6.750 in. (171mm)	7.750 in. (197mm)	7.750 in. (197mm)	11.750 in. (298mm)	11.750 in. (298mm)
Width	7.000 in. (178mm)	10.500 in. (267mm)	16.000 in. (406mm)	16.000 in. (406mm)	15.250 in. (387mm)	15.250 in. (387mm)
Depth	4.375 in. (111mm)	3.000 in. (76.2mm)	3.625 in. (92.1mm)	3.625 in. (92.1mm)	4.125 in. (105mm)	4.125 in. (105mm)
Weight	14 lbs. (6.4kg)	8 lbs. (3.6kg)	10 lbs. (4.6kg)	12 lbs. (5.5kg)	20 lbs. (9.1kg)	26 lbs. (11.9kg)
Power Requirements (all Voltages RMS)	120V AC 60 Hz, 60 watts	120V AC 60 Hz, 0.2 A	120V AC 60 Hz, 0.25 A	120V AC 60 Hz, 0.4 A	120V AC 60 Hz, 0.6 A	120V AC 60 Hz, 1.0 A

* Continuous average sine wave output (sometimes mistakenly called "RMS" power output)

Wall-Mount Receivers & Tuner

	1010	1040	1824		1010	1040	1824	
Power Output*	100 watts	40 watts	N/A	Output Level/ Impedance:				
THD @ Rated Output	< 0.3% @ 1 kHz	< 0.3% @ 1 kHz	N/A		Tuner Output	1V 50kΩ	1V 50kΩ	500mV 47kΩ (tape)
Frequency Response (±2 dB):				Speaker Outputs	4Ω and 8Ω 25V, 70.7V	4Ω and 8Ω 25V, 70.7V	N/A	
FM Tuner	50 Hz - 15 kHz	50 Hz - 15 kHz	50 Hz - 15 kHz	MOH Output	+4 dBm @ 500Ω 1 watt @ 8Ω	+4 dBm @ 500Ω 1 watt @ 8Ω	+4 dBm @ 500Ω 1 watt @ 8Ω	
Aux Input	30 Hz - 20 kHz	30 Hz - 20 kHz	N/A	Music Mute	30 dB	30 dB	N/A	
Phone Input	200 Hz - 12 kHz	200 Hz - 12 kHz	N/A	Tuner Section:				
Mic Input	100 Hz - 12 kHz	100 Hz - 12 kHz	N/A		FM Range	87.5-108.5 MHz	87.5-108.5 MHz	88-108 MHz
Phono Input	50 Hz - 15 kHz	50 Hz - 15 kHz	N/A		Antenna Input	300Ω Balanced	300Ω Balanced	75Ω Unbalanced
Line Input	50 Hz - 15 kHz	50 Hz - 15 kHz	N/A	Sensitivity	3 μV	3 μV	2 μV	
Tone Control(s):				Tone Generator				
Bass	±16 dB @ 50 Hz	±16 dB @ 50 Hz	N/A	Chime Signal	800 Hz Single Strike	800 Hz Single Strike	N/A	
Treble	±17 dB @ 15 kHz	±17 dB @ 15 kHz	N/A	Chime Envelope	Exponential Decay	Exponential Decay	N/A	
Signal-To-Noise Ratio:				Siren Signal	700 Hz to 1.2 kHz	700 Hz to 1.2 kHz	N/A	
Aux Input	67 dB	67 dB	N/A	Siren Sweep Rate	5 Hz (200 msec)	5 Hz (200 msec)	N/A	
Phone Input	66 dB	66 dB	N/A	Protection	AC Ckt Breaker Trumpet Protect	AC Ckt Breaker Trumpet Protect	N/A	
Mic Input	60 dB	60 dB	N/A	Dimensions:				
Phono Input	64 dB	64 dB	N/A		Height	12.125 in. (308mm)	12.125 in. (308mm)	6.125 in. (156mm)
Line Input	60 dB	60 dB	N/A		Width	19.000 in. (483mm)	19.000 in. (483mm)	3.000 in. (76.2mm)
Input Sensitivity/ Impedance:					Depth	5.000 in. (127mm)	5.000 in. (127mm)	1.250 in. (31.8mm)
Mic	0.7mV/150Ω	0.7mV/150Ω	N/A	Weight	36 lbs. (16.4kg)	26 lbs. (11.8kg)	2 lbs. (0.9kg)	
Aux Input	300mV/250kΩ	300mV/250kΩ	N/A	Power Required	120V AC, 60 Hz	120V AC, 60 Hz	120V AC, 60 Hz	
Phone Input	90mV/600Ω	90mV/600Ω	N/A	(AC voltages RMS)	125 watts	83 watts	4 watts	
Phono Input	275mV/47kΩ	275mV/47kΩ	N/A					
Line Input	85mV/10kΩ	85mV/10kΩ	N/A					

* Continuous average sine wave output (sometimes mistakenly called "RMS" power output)

Shelf-Mount Amplifiers (MA Series) *(Shelf-mount amps continued on next page)*

	MA-355A	MA-605A	MA-1005A		MA-355A	MA-605A	MA-1005A	
Power Output*	35 watts	60 watts	100 watts	Input Sensitivity/ Impedance:				
THD @ Rated Output	< 1.0% @ 1 kHz	< 1.0% @ 1 kHz	< 1.0% @ 1 kHz		Mic 1 & 2 (Bal)	0.3mV 600Ω	0.3mV 600Ω	0.3mV 600Ω
Frequency Response (±2 dB)	80 - 15 kHz	80 - 15 kHz	80 - 15 kHz	Mic 1 & 2 (Unbal)	3.0mV/47kΩ	3.0mV/47kΩ	3.0mV/47kΩ	
Tone Control(s):				Mic 3	5.0mV 47kΩ	5.0mV 47kΩ	5.0mV 47kΩ	
Bass	+7/-12 dB @ 100 Hz	+7/-12 dB @ 100 Hz	+7/-12 dB @ 100 Hz	Phono	2.5mV/47kΩ	2.5mV/47kΩ	2.5mV/47kΩ	
Treble	+7/-12 dB @ 10 kHz	+7/-12 dB @ 10 kHz	+7/-12 dB @ 10 kHz	Aux 1 & Aux 2	100mV 47kΩ	100mV 47kΩ	100mV 47kΩ	
Signal-To-Noise Ratio:				Telephone	1V/600Ω	1V/600Ω	1V/600Ω	
Mic 1 & 2	> 60 dB	> 60 dB	> 60 dB	Power Amp In	1V 10kΩ	1V 10kΩ	1V 10kΩ	
Mic 3	> 55 dB	> 55 dB	> 55 dB	Output Level/ Impedance:				
Phono	> 65 dB	> 65 dB	> 65 dB		Preamp Output	1V 1kΩ	1V 1kΩ	1V 1kΩ
Aux 1 & Aux 2	> 70 dB	> 70 dB	> 70 dB	Tape Output	500mV/47kΩ	500mV/47kΩ	500mV/47kΩ	
Telephone	> 70 dB	> 70 dB	> 70 dB	Speaker Outputs	4Ω, 8Ω, 16Ω 25V, 70.7V	4Ω, 8Ω, 16Ω 25V, 70.7V	4Ω, 8Ω, 16Ω 25V, 70.7V	
Power Amp In	> 80 dB	> 80 dB	> 80 dB	Dimensions:				
Music Mute	+0 dB	+0 dB	+0 dB		Height	4.250 in. (108mm)	4.250 in. (108mm)	4.250 in. (108mm)
Protection	Fuses (AC & DC)	Fuses (AC & DC)	Fuses (AC & DC)		Width	16.50 in. (420mm)	16.50 in. (420mm)	16.50 in. (420mm)
					Depth	11.80 in. (300mm)	11.80 in. (300mm)	11.80 in. (300mm)
				Weight	16.0 lbs. (7.3kg)	22.5 lbs. (10.2kg)	27.5 lbs. (12.5kg)	
Power Required	120V AC	120V AC	120V AC	Power Required	120V AC	120V AC	120V AC	
(AC voltages RMS)	50/60 Hz, 155 watts	50/60 Hz, 150 watts	50/60 Hz, 170 watts	(AC voltages RMS)	50/60 Hz, 155 watts	50/60 Hz, 150 watts	50/60 Hz, 170 watts	

* Continuous average sine wave output (sometimes mistakenly called "RMS" power output)

Electronics Specification Charts

Shelf-Mount Amplifiers (...continued: for 9000 Series specifications, see page 39)

	MA-1506	1790-6A	1798-10	1800-40	1801-40	1810-100A	1808-60	1811-100
Power Output*	150 watts	6 watts	10 watts	40 watts	40 watts	100 watts	60 watts	100 watts
THD @ Rated Output	<0.05% @ 1 kHz	<2.0% @ 1 kHz	<2.0% @ 1 kHz	<1.0% @ 1 kHz	<1.0% @ 1 kHz	<1.0% @ 1 kHz	<1.0% @ 1 kHz	<1.0% @ 1 kHz
Frequency Response	±2 dB Power Amp 50 Hz - 18 kHz Mic Input 50 Hz - 15 kHz	±2 dB 50 Hz - 15 kHz	±2 dB 50 Hz - 15 kHz	±2 dB 50 Hz - 15 kHz 150 Hz - 14 kHz 50 Hz - 15 kHz	±2 dB 50 Hz - 15 kHz 200 Hz - 10 kHz 30 Hz - 14 kHz	±2 dB 50 Hz - 15 kHz 150 Hz - 14 kHz 50 Hz - 15 kHz	±2 dB 50 Hz - 15 kHz 150 Hz - 14 kHz 50 Hz - 15 kHz	±2 dB 50 Hz - 15 kHz
Tone Controls		-20 dB @ 10 kHz	-20 dB @ 10 kHz		-20 dB @ 10 kHz			N/A
Bass	±12 dB @ 100 Hz			±12 dB @ 50 Hz		±12 dB @ 50 Hz	±12 dB @ 50 Hz	
Treble	±12 dB @ 10 kHz			±12 dB @ 15 kHz		±12 dB @ 15 kHz	±12 dB @ 15 kHz	
Signal To Noise Ratio	>75 dB (Master @ max.)				70 dB			83 dB
Mic		65 dB	65 dB	63 dB		63 dB	63 dB	
Music			70 dB	68 dB		68 dB	68 dB	
Aux		70 dB		70 dB		70 dB	70 dB	
Power Amp						83 dB	83 dB	
Input Sensitivity/Impedance								
Mic 1 Lo Z	1.0 - 300 mV, >1.2k Ω (bal.)		0.6mV/2k Ω or 6mV/47k Ω	0.5mV/2k Ω	0.5mV/2k Ω	0.5mV/2k Ω	0.5mV/2k Ω	140 mV/600 Ω or 280 mV/75k Ω
Hi Z		6mV/47k Ω	6mV/47k Ω	or	or	or	or	
Line	>7.5 k Ω (unbal.)			50mV/1k Ω	50mV 1k Ω	50mV 1k Ω	50mV 1k Ω	
Mic 2 & 3 Lo Z				0.5mV/2k Ω		0.5mV/2k Ω	0.5mV/2k Ω	
Hi Z				or 5.0mV/47k Ω		or 5.0mV/47k Ω	or 5.0mV/47k Ω	
Music			350mV/47k Ω	240mV/47k Ω	240mV 47k Ω	240mV 47k Ω	240mV 47k Ω	
Aux	100mV/47k Ω	360mV/200k Ω				220mV/330k Ω	220mV/330k Ω	
Power Amp	0.775V/10k Ω					280mV 75k Ω	280mV 75k Ω	280 mV 75k Ω
Preamp In/out			300mV/75k Ω	200mV/75k Ω	200mV/75k Ω			
Output Level/Impedance								
Preamp Out	0.775V/600 Ω					280mV 600 Ω	280mV 600 Ω	
Tape Out	0.775V/10k Ω Aux					1v/600 Ω	1v/600 Ω	
Speaker Outputs	25V/4.2 Ω, 34.6V/8 Ω, 70.7V/33 Ω	8 Ω, 25V, 70.7V	4 Ω, 8 Ω, 25V, 70.7V	4 Ω, 8 Ω, 25V, 70.7V	4 Ω, 8 Ω, 25V, 70.7V	4 Ω, 8 Ω, 25V, 70.7V	4 Ω, 8 Ω, 25V, 70.7V	4 Ω, 8 Ω, 25V, 70.7V
Music Mute	>60 dB, adjustable		50 dB	50 dB	50 dB	50 dB	50 dB	
Protection	Dual fuses			AC Ckt. Breaker	AC Ckt Breaker	AC Ckt Breaker Trumpet Protect	AC Ckt Breaker Trumpet Protect	AC Ckt Breaker Trumpet Protect
Dimensions								
Height	5.250 in. (133mm)	2.250 in. (57mm)	3.125 in. (79.4mm)	3.625 in. (92mm)	3.625 in. (92mm)	4.000 in. (102mm)	4.000 in. (102mm)	4.000 in. (102mm)
Width	19.000 in. (482mm)	6.375 in. (162mm)	9.500 in. (241mm)	13.500 in. (343mm)	13.500 in. (343mm)	16.625 in. (422mm)	16.625 in. (422mm)	16.625 in. (422mm)
Depth	12.500 in. (317mm)	5.750 in. (146mm)	7.000 in. (178mm)	10.875 in. (276mm)	10.875 in. (276mm)	12.563 in. (319mm)	12.563 in. (319mm)	12.563 in. (319mm)
Weight	32 lbs. (14.6kg)	5 lbs. (2.3kg)	7 lbs. (3.2kg)	14 lbs. (6.4kg)	14 lbs. (6.4kg)	28 lbs. (12.7kg)	22 lbs. (10kg)	27 lbs. (12.3kg)
Rack Mount Kit (Optional)	(Rack mount is std. feature of this unit)	N/A	RPK-4	RPK-2	RPK-2	RPK-5	RPK-5	RPK-5
Power Requirements (all Voltages RMS)	120V AC, 60 Hz, 230W (100-240V int'l)	120V AC, 60 Hz, 15 watts	120V AC, 60 Hz, 15 watts	120V AC, 60 Hz, 50 watts	120V AC, 60 Hz, 50 watts	120V AC, 60 Hz, 100 A	120V AC, 60 Hz, 100 A	120V AC, 60 Hz, 100 A

* Continuous average sine wave output (sometimes mistakenly called "RMS" power output)

Shelf-Mount Receivers & Tuners

	1820	1822	MR-355A	1829-15A	1834-20	1841-40	1870-20	1873-40
Power Output*	N/A	N/A	35 watts	15 watts	20 watts	40 watts	20 watts	40 watts
THD @ Rated Output	N/A	N/A	< 1.0% @ 1 kHz	< 1.0% @ 1 kHz	< 1.0% @ 1 kHz	< 1.0% @ 1 kHz	< 1.0% @ 1 kHz	< 1.0% @ 1 kHz
Frequency Response (±2 dB):								
Tuner	FM 50 Hz - 15 kHz AM 50 Hz - 5 kHz	FM 50 Hz - 15 kHz AM 50 Hz - 5 kHz	FM 80 Hz - 15 kHz	FM Only	FM Only	FM Only	AM - FM	AM - FM
Power Amp			80 Hz - 15 kHz	50 Hz - 15 kHz	50 Hz - 15 kHz	50 Hz - 15 kHz	50 Hz - 15 kHz	50 Hz - 15 kHz
Page Input	N/A	N/A	N/A	N/A	200 Hz - 10 kHz	200 Hz - 10 kHz	200 Hz - 10 kHz	200 Hz - 10 kHz
Music Input	N/A	N/A	N/A	N/A	30 Hz - 14 kHz	30 Hz - 14 kHz	30 Hz - 14 kHz	30 Hz - 14 kHz
Tone Control(s)	N/A	N/A	+7 -12 dB @ 100 Hz +7 -12 dB @ 10 kHz	-20 dB @ 10 kHz	-20 dB @ 10 kHz	-20 dB @ 10 kHz	-20 dB @ 10 kHz	-20 dB @ 10 kHz
Signal-To-Noise Ratio	55 dB	55 dB	>70 dB (aux 1 & 2)	70 dB	70 dB	70 dB	70 dB	70 dB
Input Sensitivity/Impedance:								
Page	N/A	N/A	1.0V/600Ω (phone) 0.3mV/600Ω (bal mic) 3.0mV/47kΩ (unbal mic)	N/A	0.5mV/2kΩ or 50mV/1kΩ	0.5mV/2kΩ or 50mV/1kΩ	0.5mV/2kΩ or 50mV/1kΩ	0.5mV/2kΩ or 50mV/1kΩ
Music	N/A	N/A	100mV/47kΩ (aux 1 & 2)	280mV/50kΩ	240mV/50kΩ	240mV/50kΩ	240mV/50kΩ	240mV/50kΩ
Preamp In/Out	N/A	N/A	1V/1kΩ	200mV/50kΩ	200mV/75kΩ	200mV/75kΩ	200mV/75kΩ	200mV/75kΩ
Output Level/Impedance:								
Tuner Output	1V/50kΩ	1V/50kΩ	500mV/47kΩ (tape)	0.3V/3kΩ	0.3V/3kΩ	0.3V/3kΩ	0.3V/3kΩ	0.3V/3kΩ
Speaker Outputs	N/A	N/A	4Ω, 8Ω, 16Ω 25V, 70.7V	4Ω, 8Ω 25V, 70.7V	4Ω, 8Ω 25V, 70.7V	4Ω, 8Ω 25V, 70.7V	4Ω, 8Ω 25V, 70.7V	4Ω, 8Ω 25V, 70.7V
MOH Output	N/A	N/A	Level Control, 600Ω	1V @ 500Ω	Hi Z, 300mV	Hi Z, 300mV	Hi Z, 300mV	Hi Z, 300mV
Music Mute	N/A	N/A	+0 dB	N/A	30 dB	30 dB	30 dB	30 dB
Tuner Section:								
Tuning Range								
FM	88-108 MHz	88-108 MHz	88-108 MHz	88-108 MHz	88-108 MHz	88-108 MHz	88-108 MHz	88-108 MHz
AM	N/A	540 - 1650 kHz	525 - 1620 kHz	N/A	N/A	N/A	540 Hz - 1650 kHz	540 Hz - 1650 kHz
Antenna Input	FM 300Ω Bal	FM 300Ω Bal AM Low-Z	FM 300Ω Bal AM Low-Z	FM 300Ω Bal	FM 300Ω Bal	FM 300Ω Bal	FM 300Ω Bal AM Low-Z	FM 300Ω Bal AM Low-Z
Sensitivity	FM 2 μV	FM 2 μV AM 10 μV	FM 8 μV AM 5 μV	FM 2 μV	FM 2 μV	FM 2 μV AM 10 μV	FM 2 μV AM 10 μV	FM 2 μV
Protection	Fused Xfmr.	Fused Xfmr.	Fuses (AC & DC)	AC Ckt Breaker	AC Ckt Breaker	AC Ckt Breaker	AC Ckt Breaker	AC Ckt Breaker
Dimensions:								
Height	3.125 in. (79.4mm)	3.125 in. (79.4mm)	4.250 in. (108mm)	3.125 in. (79.4mm)	3.625 in. (92.1mm)	3.625 in. (92.1mm)	3.625 in. (92.1mm)	3.625 in. (92.1mm)
Width	9.500 in. (241mm)	9.500 in. (241mm)	16.50 in. (420mm)	12.375 in. (314mm)	13.500 in. (343mm)	13.500 in. (343mm)	13.500 in. (343mm)	13.500 in. (343mm)
Depth	7.000 in. (178mm)	7.000 in. (178mm)	11.80 in. (300mm)	8.250 in. (210mm)	10.875 in. (276mm)	10.875 in. (276mm)	10.875 in. (276mm)	10.875 in. (276mm)
Weight	5 lbs. (2.3kg)	6 lbs. (2.7kg)	17.5 lbs. (7.9kg)	10 lbs. (4.5kg)	15 lbs. (6.8kg)	15 lbs. (6.8kg)	15 lbs. (6.8kg)	15 lbs. (6.8kg)
Rack Mount Kit	RPK-1	RPK-4	RME-10	RPK-6	RPK-2	RPK-2	RPK-2	RPK-2
Power Required (AC voltages RMS)	120V AC 60 Hz, 5 watts	120V AC 60 Hz, 5 watts	120V AC 50-60 Hz, 170 watts	120V AC 60 Hz, 25 watts	120V AC 60 Hz, 50 watts	120V AC 60 Hz, 50 watts	120V AC 60 Hz, 50 watts	120V AC 60 Hz, 50 watts

*Continuous average sine wave output (sometimes mistakenly called "RMS" power output)

Electronics Specification Charts

Utility Amplifiers

	581	582	583	703	1701	1702
Power Output (Watts*)	8 W @ 4Ω 5 W @ 8Ω	8 W @ 4Ω 5 W @ 8Ω	8 W @ 4Ω 5 W @ 8Ω	1 W @ 8Ω 3 mW @ 500Ω	1 W @ 8Ω 3 mW @ 500Ω	1 W @ 8Ω 3 mW @ 500Ω
THD @ Rated Output	< 0.3% @ 1 kHz	< 0.3% @ 1 kHz	< 0.3% @ 1 kHz	< 0.3% @ 1 kHz	< 0.3% @ 1 kHz	< 0.3% @ 1 kHz
Frequency Response	± 2 dB 50 Hz – 15 kHz	± 2 dB 85 Hz – 15 kHz	± 2 dB 60 Hz – 12 kHz	± 2 dB 30 Hz – 20 kHz	± 2 dB 30 Hz – 20 kHz	± 2 dB 30 Hz – 20 kHz
Signal to Noise Ratio	75 dB	70 dB	56 dB	65 dB	65 dB	65 dB
Input Sensitivity/ Impedance	50mV/47kΩ	50mV/10kΩ or 50mV/1kΩ	0.5mV/2kΩ or 5mV/47kΩ	0.5mV/2kΩ or 5mV/47kΩ	50mV/47kΩ	50 mV/10kΩ
Output Impedance	3.2Ω to 8Ω	3.2Ω to 8Ω	3.2Ω to 8Ω	8Ω and 500Ω	8Ω and 500Ω	8Ω and 500Ω
Dimensions						
Height	6.125 in. (156mm)	6.125 in. (156mm)	6.125 in. (156mm)	5.000 in. (127mm)	6.125 in. (156mm)	6.125 in. (156mm)
Width	3.000 in. (76.2mm)	3.000 in. (76.2mm)	3.000 in. (76.2mm)	3.500 in. (88.9mm)	3.000 in. (76.2mm)	3.000 in. (76.2mm)
Depth	1.250 in. (31.8mm)	1.250 in. (31.8mm)	1.250 in. (31.8mm)	2.500 in. (63.5mm)	1.250 in. (31.8mm)	1.250 in. (31.8mm)
Weight	3 lbs. (1.4kg)	3 lbs. (1.4kg)	3 lbs. (1.4kg)	2 lbs. (0.9kg)	2 lbs. (0.9kg)	2 lbs. (0.9kg)
Power Requirements (AC values are RMS)	24V DC @ 400 mA	24V DC @ 400 mA	24V DC @ 400 mA	120V AC, 5W, 60 Hz 60 Hz, 5W	12V DC @ 300 mA	12V DC @ 300 mA

* Continuous average sine wave output (sometimes mistakenly called "RMS" power output)

Telephone Interconnect & Other Accessories

	VOX-15	ACR-1	TM 2, TM 2P, TT 4A	TIA 25, TIA 70	TL 600	TRG, TSA	TAP	ZP 3A
Outputs	15W into 45Ω or 15W into 25V line @ < 2% THD	Aux: 5 dB > ref. lvl. Mic: 20 dB < ref. lvl.	-20 dBm into 47kΩ** -40 dBm into 600Ω** +6 dBm into 47kΩ	Aprox. 0 dBm @ 500 – 600Ω	1 x 150 or 600Ω or 1 x 150Ω or 2 x 150 or 300Ω	+4 dBm into 600Ω† -0.5 dBm into 600Ω* 1V into 47kΩ (both)	-0.5 dBm into 600Ω 1V into 47kΩ	3dB loss @ 600Ω 1-zone 2dB loss @ 150Ω 3-zone 3 output zones
Inputs	50 mV/500–600Ω	0 dBm @ 600Ω c.t.	+4 dBm @ 600Ω c.t.	TIA-25: 25V line TIA-70: 70.7V line	+12 dBm max @ 600Ω	+0-130V @ 20-60Hz†† +0-150V @ 15-68Hz†*	RJ-11 phone input	+4 dBm max. @ 600Ω 50 mA DC max.
Freq. Response	300 – 3 kHz (± 2 dB)*	100 – 10 kHz (± 1dB)	50 – 15 kHz (± 2dB)	50 – 15 kHz (± 2dB)	100 – 15 kHz @ 0 mA† 300 – 15 kHz @ 50 mA†	480 600 Hz to 1000 1250 Hz ††	100 – 20 kHz (± 1dB)	300 – 8 kHz (± 3dB)
Other	55 dB S/N ratio	4A DPDT contacts	Adjustable level on TM-2P		1400V DC isolation	Ring rate 4.5-9 Hz †† Dial tone detect 400Hz	24 or 48V Talk Batt 18 – 30mA loop curr.	Activate freq: 697 Hz, 770 Hz, 852 Hz, 941 Hz
Dimensions:								
Height	3.125 in. (79.4mm)	2.500 in. (63.5mm)	2.000 in. (50.8mm)	1.000 in. (25.4mm)	3.875 in. (98.4mm)	6.125 in. (156mm)	6.125 in. (156mm)	6.750 in. (171.9mm)
Width	12.38 in. (314mm)	3.500 in. (88.9mm)	3.875 in. (98.4mm)	3.875 in. (98.4mm)	2.000 in. (50.8mm)	3.000 in. (76.2mm)	3.000 in. (76.2mm)	10.500 in. (267mm)
Depth	8.250 in. (210mm)	5.125 in. (130mm)	1.000 in. (25.4mm)	2.000 in. (50.8mm)	1.000 in. (25.4mm)	1.250 in. (31.8mm)	1.250 in. (31.8mm)	3.750 in. (95.3mm)
Weight	8 lbs. (3.6kg)	2 lbs. (0.9kg)	1 lb. (0.45kg)	1 lb. (0.45kg)	15 lbs. (6.8kg)	1 lb (TRG), 2 lb (TSA)	2 lbs. (0.9kg)	3 lbs. (1.4kg)
Power Required (AC voltages RMS)	120V AC 60 Hz, 40 watts	120V AC 60 Hz, 5 watts	N/A	Approx. 2 mW from spkr. line	120V AC 60 Hz, 80 watts	Ring Equivalents TRG: 0.2B 1SA, 1.5B	120V AC 80 60 Hz, 100A	120V AC, 60 Hz, 0.13A or 24V DC, 400 mA
Notes	* Contoured for phone line	Relay, sensitivity 20mV @ 2.5 kHz	** Low-level output on TM-2 only; TT-4A same as TM-2 but in octal plug in package.		† ± 1 dB response.	† TRG, †* TSA, 1Amp SPDT relay in TSA	1A DPDT relay to indicate loop current High-Z out level adj.	Activate 1 or all 3 zones