



Electro-Voice

**Professional
Sound
Reinforcement
Products**

**New Products
Supplement**

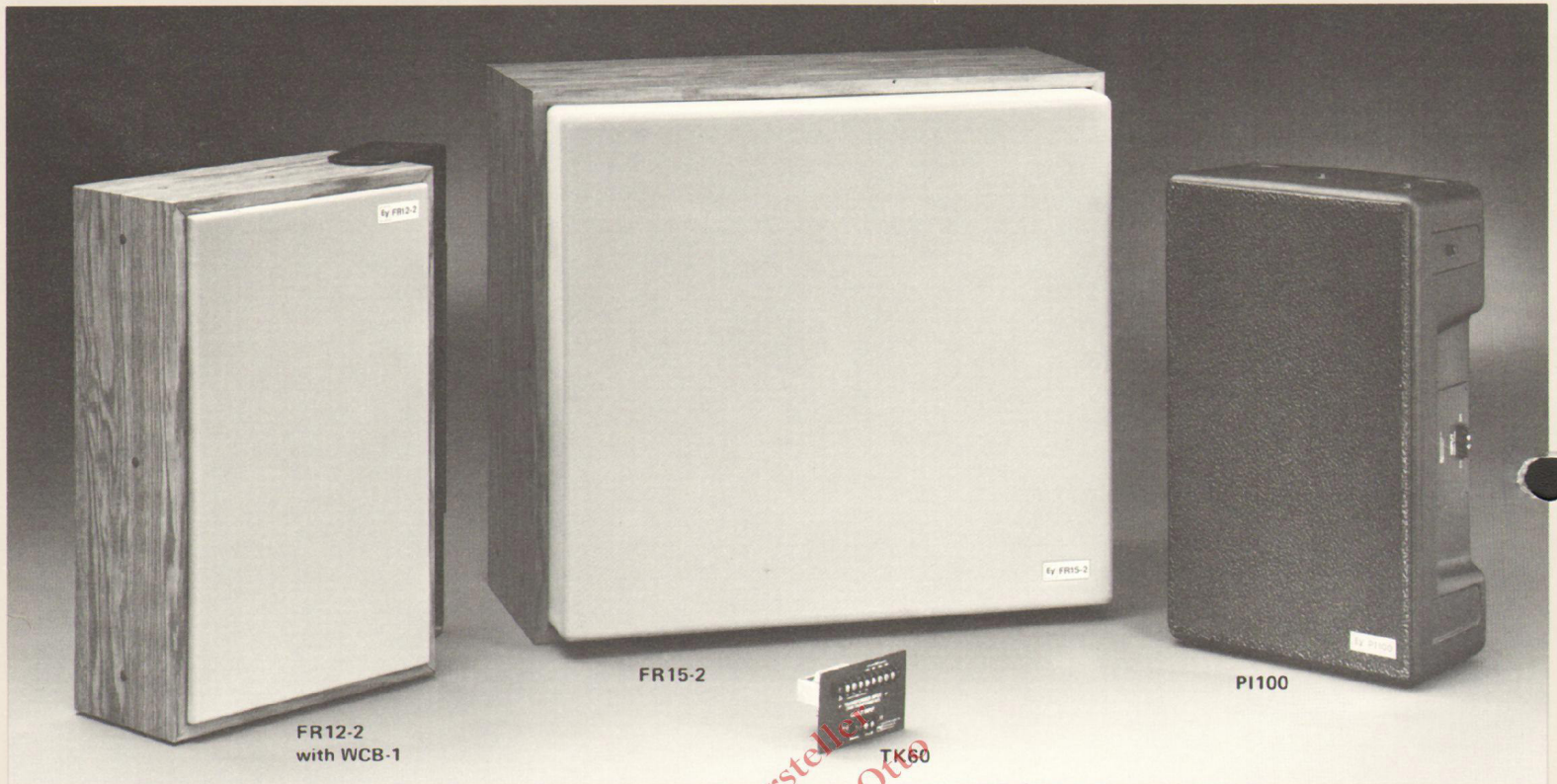


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To be used with main
Professional Sound
Reinforcement Products
Catalog (Form 2214).



Constant-Directivity Speaker Systems



The FR12-2, PI100, and FR15-2 are two-way, full-range speaker systems. They radiate sound over well-defined coverage zones and are substantially more sensitive (96-97 dB, 1 watt, 1 meter) and more rugged (100-200 watts long-term-average power capacity) than many other systems that might be considered. This performance, coupled with their size, appearance, and physical configuration, makes the FR12-2, PI100, and FR15-2 useful in an unusually wide variety of sound reinforcement and playback installations.

A New System Type: Constant Directivity

"Constant directivity" means the aiming of a wide range of frequencies over a well-defined coverage angle, say 90° x 40°. While most speakers intended for commercial application carry a rated coverage angle, the actual coverage angle often varies widely over the frequency range, depriving certain parts of the audience of the full program content. An example is the high-frequency "beaming" of many older horns and tweeters.

In 1972, Electro-Voice conceived the constant-directivity high-frequency horn. When the HR series was introduced in the mid 1970's, it set a whole new standard for coverage-angle control.

The FR12-2, PI100, and FR15-2 carry this concept of constant directivity one step further. In these systems, the crossover

frequency and geometry of the speaker components have been carefully selected so that the coverage angles of the woofer and high-frequency element match at the crossover frequency. This creates a new system type—the constant-directivity system—where woofer and tweeter join together to provide an unusually uniform coverage angle over an expanded frequency range.

FR12-2 and PI100

The FR12-2 and PI100 offer a 100° x 100° coverage angle and are unusually small, occupying less than 1.8 cubic feet. The foundation of both systems is a rugged 12-inch woofer mounted in an enclosure vented for optimum overall performance. High frequencies are handled by EV's famous Super-Dome™, a 1.5-inch radiator with a 25-watt long-term-average power capacity, fully five times that of the usual dome tweeter. The Super-Dome is placed behind a 9" x 9" Direktor™ which defines the 100° x 100° coverage angle over a wide frequency range. This contrasts with the dispersion of a simple dome radiator, which is very wide at low frequencies and gets much narrower as frequency increases.

The FR12-2 has a particle-board enclosure finished in an attractive oak-grain vinyl and equipped with a beige cloth grille. This appearance complements many interiors. The enclosure may be painted when the wood-grain finish is not appropriate. The PI100 is designed for outdoor as well as

indoor application. In addition, it is very light: 28 lb. The PI100's one-piece polyethylene enclosure is weather resistant, ultraviolet stabilized and has a molded-in black color. The entire front face of the enclosure is protected by a black-painted metal grille, lined with an acoustically transparent foam which acts as a water shield for the speaker components and enclosure vents.

Optional Accessories. The WCB-1 U-bracket facilitates mounting on walls and ceilings. The TK60 line-transformer kit may be substituted for the supplied input panel. It allows direct (8-ohm) input to the system or access to any of the seven transformer taps covering 7.5, 15, 30, and 60 watts at 25 and 70.7 volts.

FR15-2

Like the FR12-2, the FR15-2 has a particle-board enclosure finished in an attractive oak-grain vinyl and equipped with a beige cloth-covered grille. Compared to the smaller FR12-2, the FR15-2 provides a more controlled, wider-than-high coverage pattern of 90° x 40° that matches many rooms. It also has somewhat higher sensitivity, twice the power capacity, and more output below 80 Hz (3 dB down at 50 Hz).

The FR15-2 employs the same woofer that is used in EV's famous TL low-frequency systems—the EVM-15L Series II, mounted in an optimally vented enclosure. High frequencies are handled by a wide-range compression driver coupled to a 90° x 40° constant-directivity horn.

DL15X Low-Frequency Reproducer

The DL15X low-frequency reproducer is a 15-inch driver designed for professional high-level, high-fidelity sound reinforcement and monitoring, suitable for a broad variety of vented and horn enclosures. Great care taken in the selection of diaphragm materials and construction ensures a smooth, musical upper-bass sound quality and accurate low-frequency shock capability (punch). At the heart of the DL15X is the carefully engineered drive system shown to the right. Its design assures high efficiency, linear, low-distortion output and high power capacity.

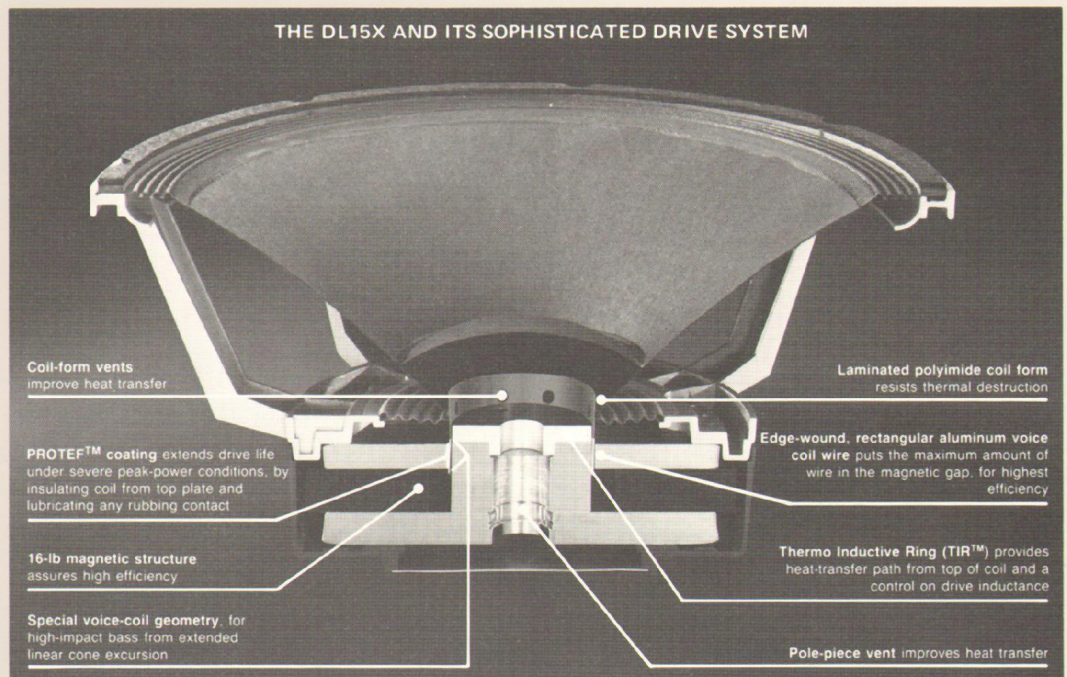
Advanced Coil Construction

The DL15X voice coil is constructed of edge-wound, rectangular aluminum wire, a fundamental technique for maximizing the amount of wire in the magnetic gap that results in maximum efficiency. For high power capacity, the coil is mounted on a laminated polyimide form and assembled using the most advanced epoxies, insulations and materials available.

The extended length of the voice coil allows increased linear travel, a prerequisite for high-impact reproduction of very low frequencies. By making unusually efficient use of the fringe flux that exists in all real-world speaker designs, the reduction in efficiency associated with a voice coil that overhangs the pole piece is kept to a minimum: the half-space reference efficiency of the DL15X is an impressive 5%, at the high end of that possible for direct radiators.

Two EV Exclusives: TIR™ and PROTEF™

The high-excursion, high-power-capacity drive of the DL15X is augmented by two exclusive Electro-Voice features: the Thermal Inductive Ring, TIR, and PROTEF coating. The TIR is essentially an aluminum ring fastened to the magnetic structure's pole piece. This acts as a control on drive inductance and, more importantly, provides a major heat-transfer path from the top of the voice coil, normally the important thermal weakness of long-throw-drive designs. In combination with the DL15X's advanced coil



design and suspension characteristics, the TIR results in an unusually high long-term-average power capacity: 400 watts of shaped pink noise for eight hours per EIA Standard RS-426A, and 500 watts of 100-1000-Hz pink noise for two hours, per AES recommended practice.

PROTEF is a Teflon-based coating applied to the inside diameter of the magnetic structure's top plate, adjacent to the voice coil. Occasionally, violent power peaks of several seconds in duration will expand a normal driver's coil into contact with the top plate, damaging the coil. PROTEF provides protection by lubricating any rubbing contact and inserting electrical insulation between the coil and the top plate.

Low-Frequency Performance in Recommended Enclosures

The DL15X works in a broad variety of vented and horn enclosures.

For most applications, optimally vented enclosures—which take advantage of the Thiele-Small parameters listed in the specifications—provide the best combinations of efficiency, box size, and system low-frequency limit. The specifications section describes low-frequency performance in the TL606 3.2-cubic-foot vented box and in a 6.4-cubic-foot vented box. Low-frequency limits range from 63 Hz to 34 Hz. TL606 plans are available from Electro-Voice at no charge.

The TL4025/4050 horn enclosure plans are also available. The TL4050 enclosure holds two DL15X's. This system provides a very high conversion efficiency of 20%, a 1-watt/1-meter sensitivity of 108 dB and a low-frequency cutoff of 40 Hz, perfect for ultra-high-output low-bass applications where the large size of a horn is acceptable.



Specifications

Constant-Directivity Systems¹

	FR12-2	P1100	FR15-2
Frequency Response:	80-18,000 Hz	80-18,000 Hz	50-15,000 Hz
Half-Space Reference Efficiency (woofer):	2.3%	2.3%	6.2%
Long-Term-Average Power Capacity per EIA Standard RS-426A: ²	100 watts	100 watts	200 watts
Sound Pressure Level at 1 Meter, 1 Watt into 8 ohms, 300-2000 Hz Pink Noise:	96.0 dB	96.0 dB	97.0 dB
Nominal Coverage Angle (horizontal x vertical): ³	100° x 100°	100° x 100°	90° x 40°
Horizontal and Vertical Coverage Angles, 6 dB Down, One-Third-Octave Bands of Pink Noise—			
1,000 Hz: ⁴	105°	105°	102° x 112°
2,000 Hz:	85°	85°	83° x 95°
4,000 Hz:	100°	100°	102° x 52°
8,000 Hz:	87°	87°	94° x 38°
16,000 Hz:	52°	52°	82° x 47°
Crossover Frequency:	1500 Hz	1500 Hz	1500 Hz
Impedance—Nominal:	8 ohms	8 ohms	8 ohms
Minimum:	6.5 ohms	6.5 ohms	7.2 ohms
Transducer Complement—High Frequency:	1.5-in Super-Dome™ with Direktor™	1.5-in Super-Dome™ with Direktor™	DH1202 driver on 90° x 40° horn
Woofer:	12 in.	12 in.	EVM-15L Series II (15 in.)
Input Connections:	Screw terminals	Screw terminals	Screw terminals
Box Material and Finish:	Vinyl-clad particle board	Medium-density polyethylene with foamed inner wall and hard outer wall	Vinyl-clad particle board
Color(s):	Oak-grain box with beige grille	Black	Oak-grain box with beige grille
Environmental Application:	Indoors	Indoors/outdoors	Indoors
Optional Accessories:	WCB-1 wall/ceiling mounting bracket; TK60 25/70.7-V transformer kit	WCB-1 wall/ceiling mounting bracket; TK60 25/70.7-V transformer kit	
Dimensions—Height:	64.8 cm (25.5 in.)	61.0 cm (24 in.)	72.1 cm (28.4 in.)
Width:	41.9 cm (16.5 in.)	38.1 cm (15 in.)	80.0 cm (31.5 in.)
Depth:	22.2 cm (8.75 in.)	21.6 cm (8.5 in.)	42.2 cm (16.6 in.)
Net Weight:	20.4 kg (45 lb)	12.7 kg (28 lb)	43.5 kg (96 lb)
Shipping Weight:	21.3 kg (47 lb)	13.6 kg (30 lb)	48.0 kg (106 lb)

1. All acoustic measurements made in an anechoic environment.

2. The EIA test spectrum is shaped pink noise and is applied for eight hours; crest factor is 6 dB.

3. Long FR15-2 axis horizontal.

4. Ten-foot measuring distance; long system axes vertical for FR12-2 and P1100, horizontal for FR15-2.

Low-Frequency Reproducer¹

DL15X

Frequency Response: ²	45-3200 Hz ± 3 dB
Low-Frequency 3-dB-Down Points in 6.4-Cubic-Foot Vented Enclosure—Normal (tuned to 42 Hz):	45 Hz
Step-Down Mode (with equalization, tuned to 30 Hz): ³	34 Hz
Low-Frequency 3-dB-Down Points in TL606 ⁵ 3.2-Cubic-Foot Vented Enclosure—Normal (tuned to 55 Hz):	63 Hz
Step-Down Mode (with equalization, tuned to 40 Hz): ³	45 Hz
Long-Term-Average Power Capacity—per EIA Standard RS-426A and AES Recommended Practice, 40-400 Hz: ⁶	400 watts
per AES Recommended Practice, 100-1000 Hz: ⁶	500 watts
Sound Pressure Level at 1 Meter, 1 Watt into 8 Ohms—	
200-4000-Hz Average:	102 dB
100-800-Hz Average:	100 dB
Impedance, Minimum:	8 ohms
Thiele-Small Parameters for Prediction of Performance in Vented and Sealed Enclosures— f_s (free-air resonance frequency):	40 Hz
Q_{ts} (total Q at f_s):	0.26
η_o (half-space reference efficiency):	5%
V_{as} (compliance equivalent volume):	0.230 m ³ (8.1 ft ³)
S_d (effective diaphragm area):	0.086 m ² (133 in. ²)
X_{max} (zero-to-peak linear displacement of diaphragm): ⁷	4.1 mm (0.16 in.)
P_o (max) (thermally limited maximum input power):	400 watts
R_e (dc resistance of voice coil):	6.0 ohms

Maximum Excursion before Damage, Zero to Peak:	12.7 mm (0.5 in.)
Voice Coil—Diameter:	63.5 mm (2.5 in.)
Construction:	Edge-wound rectangular aluminum wire on a laminated polyimide form
Magnet—Weight:	2.2 kg (4.9 lb)
Material:	Ceramic 5
Magnetic Structure Weight:	7.2 kg (16 lb)
Colors:	EV dark red and EV light grey
Input Connections:	Push terminals
Overall Dimensions—Depth:	17.8 cm (7 in.)
Diameter:	38.4 cm (15.1 in.)
Optional Accessories:	SMH-1 mounting hardware kit
Net Weight:	8.9 kg (20 lb)
Shipping Weight:	10.3 kg (23 lb)

Electro-Voice engineering continually improves existing products, as well as creating new ones. Thus specifications given in this brochure are subject to change without notice.

1. All acoustic measurements made in an anechoic environment unless otherwise noted.

2. In 6.4-cubic-foot vented enclosure tuned to 42 Hz.

3. Proper equalization is provided by a second-order under-damped filter with a 6-dB boost at the box tuning frequency.

4. Actual 3-dB-down point is 125 Hz, but response drops only 0.5 dB until reaching a "knee" at 45 Hz.

5. Plans available from Electro-Voice at no charge.

6. The EIA test spectrum is shaped pink noise with a 6-dB crest factor, applied for eight hours; AES recommended practice is pink noise with a 6-dB crest factor, band-limited as indicated and applied for two hours; test environment in both cases is free air.

7. For 10% distortion of the current waveform at f_s , a conservative rating method.



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WARRANTY (Limited)

Electro-Voice Professional Sound Reinforcement Loudspeakers and accessories are guaranteed for five years from date of original purchase against malfunction due to defects in workmanship and materials. If such malfunction occurs, unit will be repaired or replaced (at our option) without charge for materials or labor if delivered prepaid

to the proper Electro-Voice service facility. Unit will be returned prepaid. Warranty does not cover finish or appearance items or malfunction due to abuse or operation at other than specified conditions. Repair by other than Electro-Voice or its authorized agencies will void this guarantee.

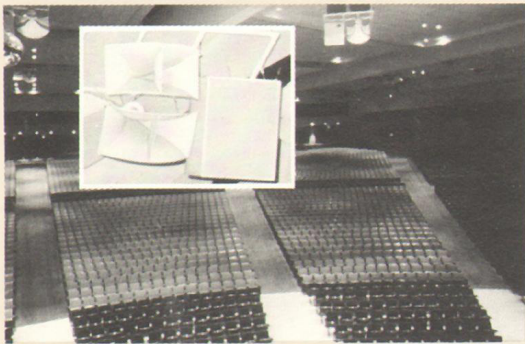


Electro-Voice®

Professional
Sound
Reinforcement
Products



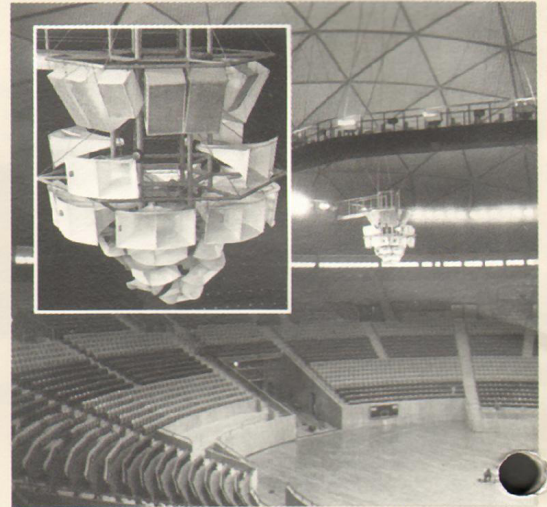
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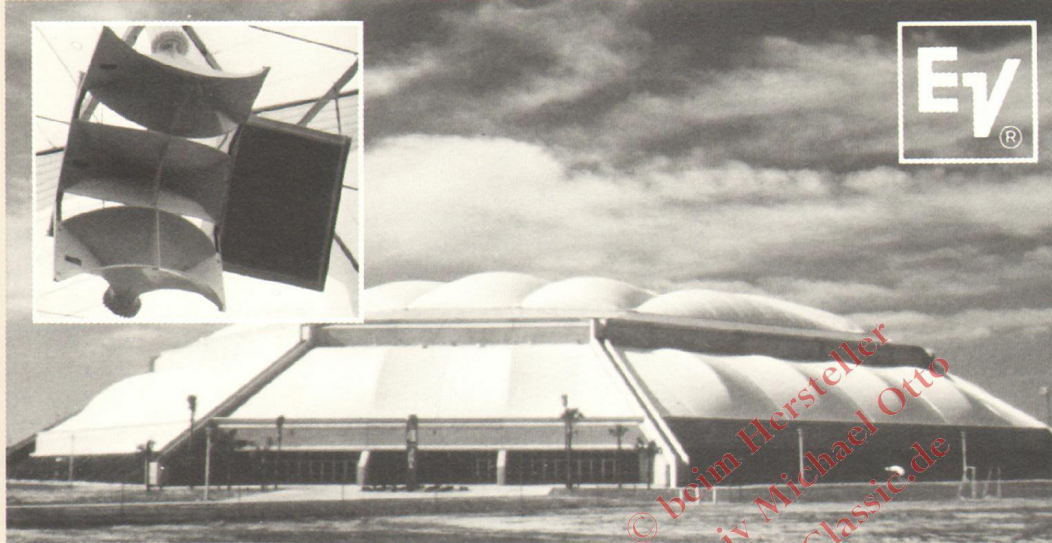
Sundome Center for the Performing Arts (7,200 seats, 1980)
Sun City West, Arizona



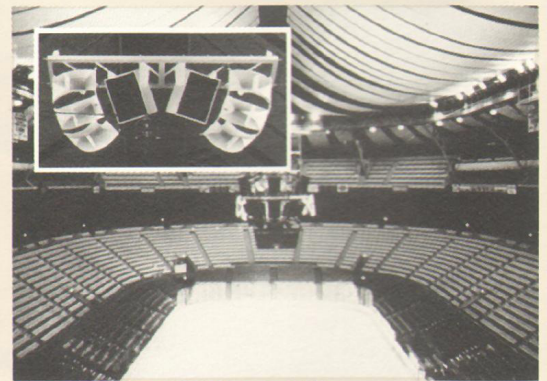
Presidential Inauguration (1981)
Washington, D.C.



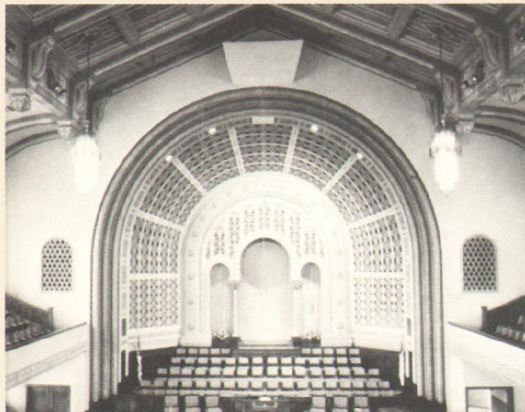
University of Wyoming Arena (15,000 seats, 1981)
Laramie, Wyoming



Stephen C. O'Connell Center (13,000 seats, 1980)
University of Florida (Gainesville)



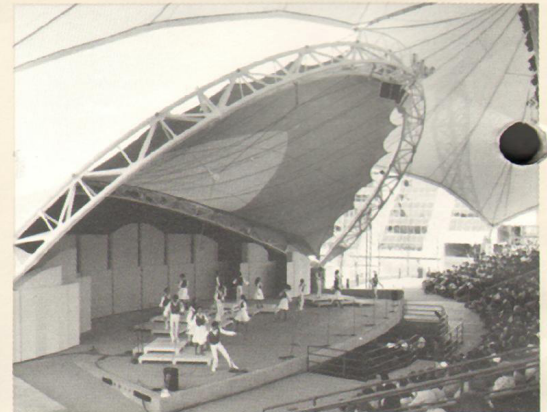
The Checkerdome (20,000 seats, 1978)
St. Louis, Missouri



First Baptist Church (1,400 seats, 1978)
Amarillo, Texas



Yankee Stadium (54,000 seats, 1976)
New York, New York



Tennessee State Amphitheater, 1982 World's Fair (2000 seats)
Knoxville, Tennessee

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The E-V Contribution

Electro-Voice manufactures a broad variety of precision crafted transducers for high-quality fixed-installation sound systems. Typical applications include churches, gymnasiums, stadiums, arenas, performing arts centers, theaters, auditoriums, ballrooms, clubs, and amusement parks.

When E-V professional sound reinforcement components first appeared in 1975, they were immediately recognized as a fundamental contribution to the art by prominent acoustic consultants. Major systems were specified *without allowable alternatives*. Today, Electro-Voice professional sound components are in use in installations large and small, throughout the world. Various large Electro-Voice installations are listed in the table below; others are shown on the opposite page.

Michigan State University Performing Arts Center (1982)
East Lansing, Michigan

Disney World
Lake Buena Vista, Florida

Montreux Jazz Festival
(Montreux Casino, 1977 and following years)
Montreux, Switzerland

British Columbia Place Amphitheater
(60,000 seats, 1983)
Vancouver, B.C., Canada

Helen F. Spencer Theater (735 seats, 1979)
University of Missouri - Kansas City

College Church of the Nazarene
(4,000 seats, 1981)
*Mid-America Northern College,
Lawrence, Kansas*

Ellis Park Stadium (85,000 seats, 1982)
Johannesburg, South Africa

Circus World
Orlando, Florida

Frank Erwin Center (18,000 seats, 1978)
University of Texas (Austin)

Folly Theater (1,000 seats, 1980)
Kansas City, Missouri

Saint Phillip Neri Church (1,200 seats, 1981)
Harahan, Louisiana

Sea World
Orlando, Florida

Hartford Civic Center Arena
(16,000 seats, 1980)
Hartford, Connecticut

Brigham Young University Cannon Activities Center - Hawaii Campus (5,000 seats, 1981)
Laie, Hawaii

Virginia Beach Arts and Conference Center (1980)
Virginia Beach, Virginia

The Performing Arts Center (1980)
University of Texas (Austin)

Pontiac Silverdome (80,000 seats, 1976)
Pontiac, Michigan

Dordt College Chapel (1,500 seats, 1979)
Sioux Center, Iowa

King Khalid International Airport (KKIA) (1982)
Riyadh, Saudi Arabia

Experience. To the products employed in these installations, Electro-Voice brings over fifty years of experience in designing and building transducers from the ground up. In the manufacturing process, we die cast and finish our own speaker frames. We wind our own voice coils of edgewound flattened wire, and mold plastic parts. We form the aluminum diaphragms for our high-frequency drivers.

Testifying to the design achievements of Electro-Voice engineers are over one-hundred-and-sixty patents. These patents include fundamental contributions to the state-of-the-art such as the Variable-D™ cardioid microphone (free of up-close bass boost and off-axis response coloration) and the "constant-directivity" high-frequency horn, described in detail later in this brochure.

A Fresh Look and a New Product Line.

The speaker components used in today's high-quality sound reinforcement systems grew from the development work done over fifty years ago during the birth of the sound movie industry. About ten years ago, Electro-Voice took a serious look at the available components, many of which bore a striking resemblance in performance and mechanical construction to the original pioneering products. We wondered if the increasing demand for quality and high performance in sound reinforcement systems had rendered some of the pioneering products obsolete. In our review, we found high-frequency horns that did not spread sound evenly throughout an audience, despite what the "specs" promised. We found high-frequency compression drivers whose performance was compromised by low power capacity, leading often to long-term system reliability problems. We found low-frequency systems which were needlessly large and bulky for many high-quality applications. At that time, Electro-Voice became the first manufacturer to systematically attack these performance compromises with fresh engineering ideas and the advantage of the latest materials and manufacturing technology.

Today, Electro-Voice offers a comprehensive line of loudspeaker components, systems, and accessories. Electro-Voice Professional Sound Reinforcement Products provide acoustic performance that is superior to most and second to none, in physical packages that create new possibilities for neat, esthetically pleasing installations.

How to Use This Catalog

This catalog brings together the core group of Electro-Voice products for professional sound reinforcement systems. In the following pages the unique and useful contributions by Electro-Voice are clearly outlined and specifications are fully set forth for convenient and meaningful product comparisons.

More Product Information

Electro-Voice has detailed engineering data sheets available for each system component. When they first appeared, these data sheets set a new standard for product information that is still being adopted by the other members of our industry. They represent a major step toward making certain that sound reinforcement requirements and expectations are met and exceeded. Write to Electro-Voice for engineering data sheets on any specific component or system that interests you.

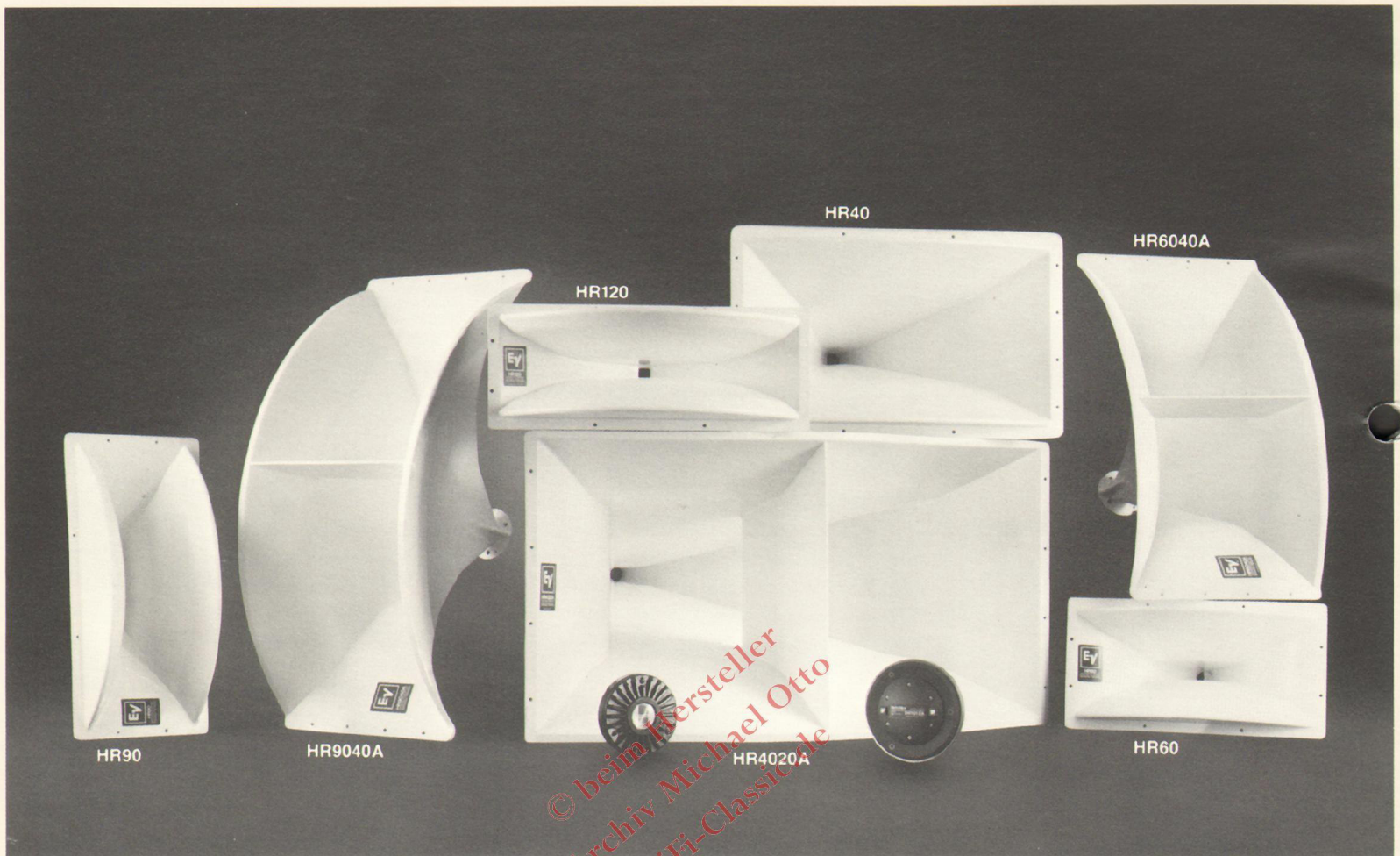
Electro-Voice Publications

In this catalog, we have tried to clearly present the performance specifications and unique characteristics of Electro-Voice Professional Sound Reinforcement Products. However, a basic knowledge of sound system design concepts and the meaning of product specifications is assumed.

If you need additional background material, the E-V *P.A. Bible* and our continuing series of Additions provide an excellent source. Send \$2.00 to *P.A. Bible*, Electro-Voice, Inc., 600 Cecil Street, Buchanan, Michigan 49107. Additional information is also available in *The E-V Guide to Commercial Sound Reinforcement and Public Address Systems*, available from Electro-Voice at no charge.



Horns



Specifications: ¹	HR40	HR60	HR90	HR120	HR4020A	HR6040A	HR9040A
Throw:	Long	Medium	Short	Short	Long	Medium	Short
Horizontal Coverage Angle, 6 dB Down – Average:	44° (+7°, -6°) (630-16,000 Hz)	68° (+8°, -6°) (1250-16,000 Hz)	97° (+14°, -15°) (500-16,000 Hz)	118° (+14°, -10°) (800-16,000 Hz)	43° (+9°, -4°) (400-16,000 Hz)	66° (+8°, -6°) (800-16,000 Hz)	97° (+9°, -7°) (200-16,000 Hz)
500 Hz:	61°	93°	89°	82°	52°	86°	97°
800 Hz:	48°	68°	105°	110°	47°	73°	90°
Vertical Coverage Angle, 6 dB Down – Average:	24° (+7°, -6°) (2500-16,000 Hz)	41° (+9°, -10°) (3150-16,000 Hz)	42° (+8°, -4°) (3150-16,000 Hz)	40° (+6°, -9°) (3150-16,000 Hz)	22° (+3°, -2°) (2000-16,000 Hz)	42.5° (+2.5°, -2.5°) (2000-16,000 Hz)	45° (+9°, -5°) (2000-16,000 Hz)
500 Hz:	90°	143°	163°	211°	70°	108°	144°
800 Hz:	71°	143°	212°	243°	46°	77°	82°
Directivity Factor R_0 (Q), Average:	50.6 (+14.3, -15.7) (2000-16,000 Hz)	18.8 (+8.6, -4.9) (1600-16,000 Hz)	10.4 (+5.8, -3.4) (1250-16,000 Hz)	8.7 (+6.1, -2.5) (2000-16,000 Hz)	48.7 (+10.4, -12.6) (1250-16,000 Hz)	17.7 (+6.3, -5.6) (800-16,000 Hz)	10.9 (+2.5, -1.5) (800-16,000 Hz)
Directivity Index D_i, Average:	17 dB (+1.1, -4 dB) (2000-16,000 Hz)	12.7 dB (+1.7, -1.2 dB) (1600-16,000 Hz)	10.2 dB (+1.9, -1.8 dB) (1250-16,000 Hz)	9.4 dB (+2.3, -1.4 dB) (2000-16,000 Hz)	16.9 dB (+8, -1.3 dB) (1250-16,000 Hz)	12.5 dB (+1.3, -1.7 dB) (800-16,000 Hz)	10.4 dB (+9, -6 dB) (800-16,000 Hz)
Lowest Frequency for Full Driver Loading:²	500 Hz	500 Hz	500 Hz	500 Hz	300 Hz	400 Hz	400 Hz
Minimum Recommended Crossover Frequency for Full Power Capacity, Driver or Horn Loading Limited,							
DH1012A:	500 Hz	500 Hz	500 Hz	500 Hz	400 Hz	400 Hz	400 Hz
DH1506:	800 Hz	800 Hz	800 Hz	800 Hz	800 Hz	800 Hz	800 Hz
Sound Pressure Level on Axis at 1 Meter, 1 Watt into 8 Ohms (with DH1012A or DH1506 Driver):³	115 dB	113 dB	111 dB	109 dB	116 dB	114 dB	112 dB
Construction:	Fiber-glass reinforced plastic	Fiber-glass reinforced plastic	Fiber-glass reinforced plastic	Fiber-glass reinforced plastic	Fiber-glass reinforced plastic	Fiber-glass reinforced plastic	Fiber-glass reinforced plastic
Throat Diameter:	3.3 cm (1.3 in)	3.3 cm (1.3 in)	3.3 cm (1.3 in)	3.3 cm (1.3 in)	3.3 cm (1.3 in)	3.3 cm (1.3 in)	3.3 cm (1.3 in)
Color:	White	White	White	White	White	White	White
Dimensions – Height:	44.8 cm (17.6 in)	28.6 cm (11.3 in)	28.4 cm (11.2 in)	25.6 cm (10.1 in)	61.5 cm (24.2 in)	44.7 cm (17.6 in)	44.7 cm (17.6 in)
Width:	72.9 cm (28.7 in)	54.8 cm (21.6 in)	60.8 cm (23.9 in)	67.1 cm (26.4 in)	122 cm (48.0 in)	82.8 cm (32.6 in)	82.8 cm (32.6 in)
Depth:	65.4 cm (25.8 in)	38.1 cm (15.0 in)	34.9 cm (13.8 in)	38.4 cm (15.1 in)	130 cm (51.0 in)	57.7 cm (22.7 in)	57.7 cm (22.7 in)
Net Weight:	6.8 kg (15 lb)	3.2 kg (7 lb)	3.3 kg (7.3 lb)	4.5 kg (10 lb)	20.4 kg (45 lb)	6.8 kg (15 lb)	6.8 kg (15 lb)
Shipping Weight:	11.8 kg (26 lb)	5.4 kg (12 lb)	5.1 kg (11.3 lb)	6.8 kg (15 lb)	28.6 kg (63 lb)	10.4 kg (23 lb)	10.4 kg (23 lb)

1. All acoustic measurements made in an anechoic environment with indicated bands of one-third-octave pink noise, unless otherwise noted.

2. The DH1506 driver must be crossed over at 800 Hz or above for full power capacity.

3. Band-limited pink noise, 500-2500 Hz.

Electro-Voice Invented the "Constant-Directivity" Horn

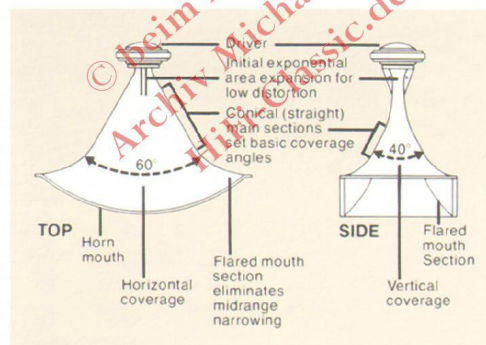
A major function of a high-frequency horn is to aim the driver's output over specific side-to-side (horizontal) and up-and-down (vertical) coverage angles. This allows the sound system designer to direct the sound at the highly absorptive audience with little or no sound aimed at reflective walls and ceilings. The result is maximum clarity and intelligibility without confusing echoes and room reverberation. Traditional "radial" and "multicellular" horns all carry rated, nominal coverage angles. However, they all depart *significantly* from their rated angles over major portions of the frequency spectrum. This makes it virtually impossible to provide uniform quality and intelligibility throughout the audience area. It also can increase cluster size, complexity, and cost if extra "overlapping" horns are added in an attempt to assure uniform coverage.

In 1972, Electro-Voice documented the variability of popular multicell and radial horn coverage angles! We quickly adopted the objective of developing a series of "constant-directivity" horns—horns which, for the first time, would provide truly uniform coverage

angles over a wide frequency range. For ease of installation and application, we also decided that our horns should have physical dimensions no larger and weights significantly lower than traditional designs. Our physical size objectives meant that the horizontal coverage angles could be uniform from at least 500 Hz, a typical crossover frequency, to 16,000 Hz. Vertical coverage angles could be uniform from about 2500 Hz to 16,000 Hz, the range containing the non-vowel, intelligibility-related components of speech.²

Our design goals were achieved through a patented³ joining of three different horn sections:

1. An initial exponentially flared throat section, for low distortion.
2. A conical (straight sided) main section, which sets the uniform coverage angle over most of the frequency range.
3. An additional flare at the mouth, approximately over the last third of the conical section and roughly double its included angle. This added flaring eliminates the narrowing of the midrange coverage angle found in multicell and radial designs.



HR6040A Constant-Directivity Horn

Today, only Electro-Voice offers a full selection of constant-directivity horns including all of the usual coverage angles and available in two basic physical sizes. Three "large" HR horns have the best directivity control. Four "small" HR horns provide uncompromised horizontal coverage but have somewhat wider coverage angles below about 2500 Hz. Unlike some other alternatives, all Electro-Voice HR horns provide proper driver loading down to 500 Hz or below. (Not all drivers can sustain their full rated power at this frequency, however.) Their one-piece fiber-glass construction is tough and light in weight. The HR horns used most often range in weight from 7 to 17 pounds, substantially lighter than typical alternatives which range from 25 to 30 pounds. The light weight of the HR horns facilitates installation and can be a necessity when traditional components exceed building load limits.

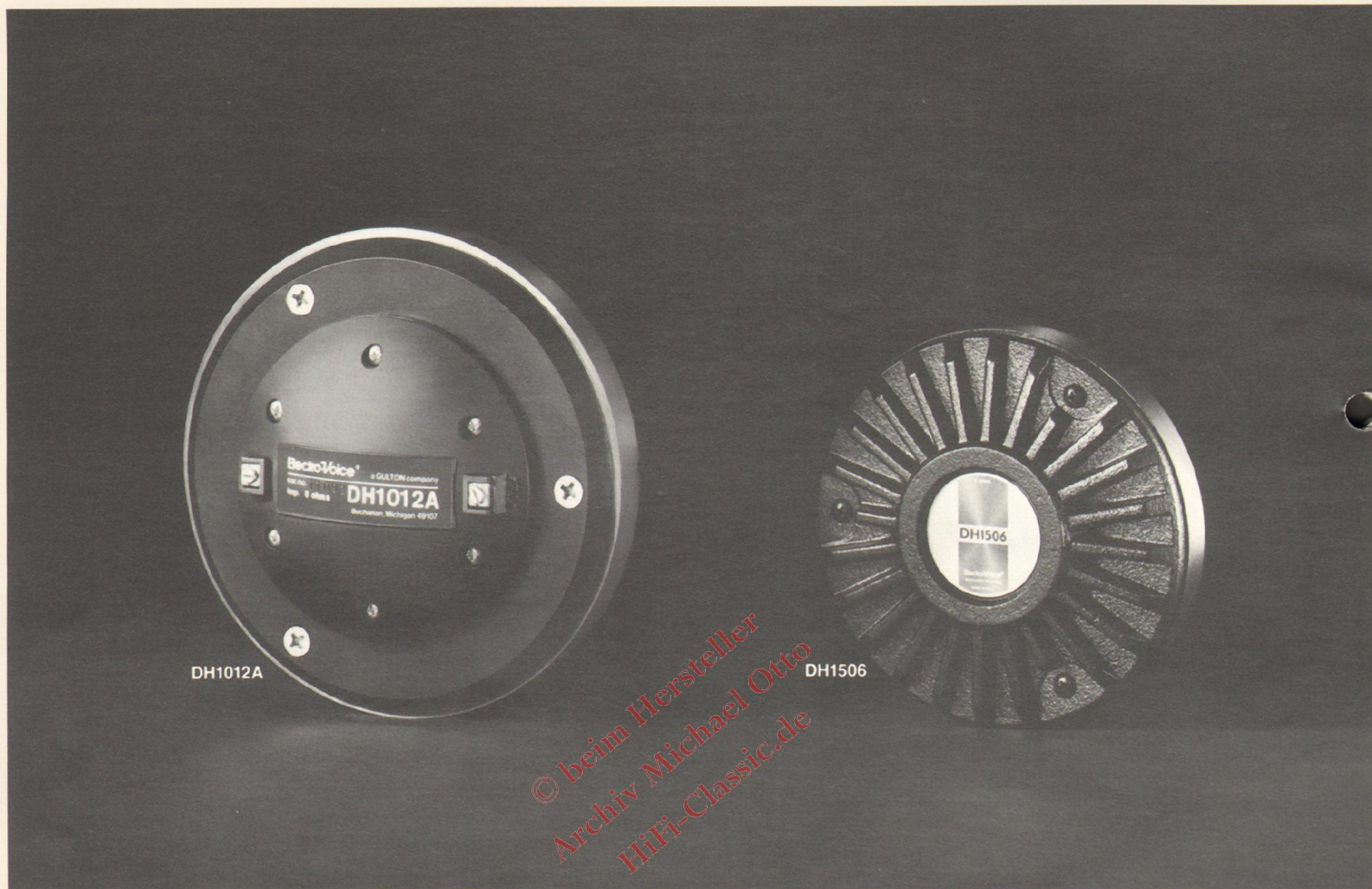
1. D.B. Keele, Jr., "What's So Sacred about Exponential Horns?"; Audio Engineering Society Preprint No. 1038(F-3) (1975). Copies are available from Electro-Voice at no charge.

2. Below 2500 Hz, the vertical coverage angles widen. Maintaining a constant vertical coverage angle to 500 Hz requires a vertical horn dimension of at least 30 inches, judged too large for many installations.

3. U.S. Patent Number 4071112, applied for on September 30, 1975, issued on January 30, 1978.



Drivers



DH1012A

DH1506

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Specifications: ¹	DH1012A	DH1506
Power Frequency Response:	400-12,000 Hz (essentially flat, 400-2500 Hz, with controlled rolloff to 12,000 Hz, rapid rolloff beyond) ²	500-20,000 Hz (essentially flat, 500-3000 Hz, with controlled rolloff beyond) ²
Impedance – Nominal:	8 ohms	8 ohms
Minimum (on HR horn above 500 Hz):	6.3 ohms	6.3 ohms
Mid-Band Efficiency, Pink Noise Band Limited to Indicated Range:	25% (400-2000 Hz)	25% (500-2500 Hz)
Sound Pressure Level at 1 Meter, 1 Watt into 8 Ohms, on Axis of HR6040A Horn, Pink Noise Band Limited to 500-2500 Hz:	114 dB	114 dB
Long-Term Average Power Capacity (24 hours) at 8 Ohms, Pink Noise with 10 dB Crest Factor Band Limited to Indicated Range, on HR Series Horn:	40 watts (400-15,000 Hz) ³	30 watts (800-10,000 Hz)
Recommended Minimum Crossover Frequency for Full Power Capacity (horn load permitting):	400 Hz	800 Hz ⁴
Horn Throat Diameter:	33 mm (1.3 in)	Usable with 22 mm (7/8 in) or 25 mm (1 in) throats
Voice Coil – Diameter:	76 mm (3 in)	51 mm (2 in)
Construction:	Edge-wound flattened aluminum wire on an aluminum form (form integral with diaphragm dome)	Edge-wound flattened aluminum wire on a polyamide form
Diaphragm Construction:	Aluminum-alloy dome with polyamide suspension	Aluminum-alloy dome with polyamide suspension
Magnet Material:	Ceramic 5 (barium ferrite)	Ceramic 5 (barium ferrite)
Horn Mounting Method:	Bolt-on	Screw-on (1 3/8" – 18 thread)
Color:	Black	Black
Input Connections:	Screw terminals	Push terminals
Dimensions – Overall Diameter:	191 mm (7.5 in)	155 mm (6.1 in)
Overall Depth:	71 mm (2.8 in)	99 mm (3.9 in)
Net Weight:	6.6 kg (14.7 lb)	5.1 kg (11.3 lb)
Shipping Weight:	7.1 kg (15.6 lb)	5.3 kg (11.7 lb)

1. All acoustic measurements made in an anechoic environment with indicated bands of one-third-octave pink noise, unless otherwise noted.

2. The controlled rolloff is characteristic of all compression drivers. See text.

3. The HR40, HR60, HR90, and HR120 horns will fully load the DH1012A to only 500 Hz.

4. The DH1506 may be crossed over as low as 500 Hz with reduced power capacity.

Electro-Voice Made the First High-Power-Capacity, High-Performance Compression Drivers

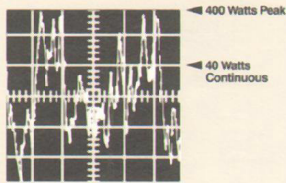
Construction. Classic high-performance compression drivers are subject to mechanical fatigue because the dome-shaped diaphragm and surrounding suspension are formed from a single piece of sheet aluminum. As this assembly flexes, high peak power inputs can fracture the part and cause driver failure.

The beryllium or titanium suspensions—recently developed—are also subject to such fracture. In addition, the cylindrical form around which a typical driver's voice coil is wound has limited heat-conducting ability, a situation which works against high long-term power capacity.

For the DH compression drivers, Electro-Voice engineers developed a new type of construction. For the 40-watt DH1012A, a one-piece aluminum-alloy dome and coil form are drawn in a single operation. The voice coil is mounted on this metallic form which acts as a heat sink for high thermal reliability. For both the DH1012A and the DH1506, the driver suspension is separately formed of a space-age polyamide material (non-metallic) which is highly resistant to destruction from flexing. The result is short-term peak and long-term average power capacities significantly higher than those of traditional one-piece diaphragm-and-suspension designs.

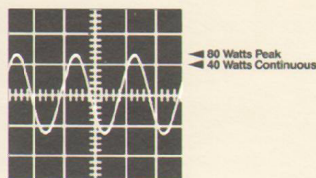
A Real-World Power Test. To fully test the effectiveness of our approach, Electro-Voice developed a power test which uses band-limited pink noise as an input signal. This test signal bears a much greater resemblance

EV's Real World Noise Power Test



to real-world vocal and instrumental inputs than do traditional sine wave signals because it contains a wide range of frequencies and has short duration peaks many times the long-term average level. (The peak value of a sine wave is only twice the average and cannot give an honest evaluation of a product's ability to withstand years of real-world use.)

Traditional Sine Wave Power Test



The high short-duration peaks test the mechanical strength of the driver's diaphragm. The long-term average level tests the heat-dissipating ability of the driver design, a factor closely related to voice-coil destruction. The DH1012A takes 40 watts of band-limited pink noise on a 24-hour long-term basis, over 2.5 times that of typical all-metal diaphragm designs. During such a test, instantaneous peak power inputs are 10 dB higher, or 400 watts.

Maximum Efficiency. Superior power capacity is achieved without sacrificing conversion efficiency. Electro-Voice DH drivers are "maximum efficiency" designs, being about 30% efficient in the mid-band, up to about 2500 Hz, and decreasing in efficiency at about 6 dB per octave above that frequency. This characteristic, which we call the "Newman Criteria," results from the practical problem of making the mass of the moving parts (diaphragm and voice coil) any lower and/or the strength of the magnetic motor (magnet and related steel parts) any higher. The Newman Criteria is an excellent standard against which to compare any compression driver, and is approximately met by the finest designs. Some newer drivers sacrifice substantial mid-band efficiency (as much as 4 or 5 dB) in order to give the impression of having superior high-frequency output. Since the maximum energy of typical program material is predominantly in the midrange, only maximum-efficiency designs such as the Electro-Voice DH drivers can minimize amplifier power requirements and maximize driver reliability.

DH1012A versus DH1506. The DH1012A is a large-throat design (1.3-inch diameter at the driver/horn interface) with a 3-inch diameter voice coil. The DH1506 has a 1-inch throat and a 2-inch voice-coil diameter. The larger diaphragm area of the DH1012A gives it greater peak output ability in the lower end of its operating range, a lower full-power crossover frequency (400 Hz versus 800 Hz), and a somewhat higher long-term average power capacity (40 watts versus 30 watts). Efficiency-versus-frequency of the DH1012A closely follows the Newman Criteria to about 12,000 Hz, while the DH1506 continues to 20,000 Hz. With a horn load, second and third harmonic distortion across the frequency range is essentially the same for both units, *equivalent to or lower than* the best competitive units at the same acoustic output levels.

The characteristics noted above make the DH1012A and DH1506 broadly interchangeable. However, the DH1012A is particularly appropriate for stadiums, arenas, gymnasiums, large theatres and other maximum-output applications. The DH1506 is particularly applicable where more subtle, transparent performance in the upper octaves is desired instead of the utmost output ability in the lower octaves of driver performance. Churches, auditoriums, and performing arts centers are typical applications. Because the DH1506 provides unusually high power capacity and conversion efficiency, compared to traditional one-inch-throat drivers, it is fully at home in many applications where "large-throat" drivers were previously thought to be the only possible alternative.



Low-Frequency Systems



Specifications: ¹	TL606A	TL606D	TL806A	TL806D
Low-Frequency 3-dB-Down Point – Normal:	54 Hz	50 Hz	72 Hz	73 Hz
Step-Down Mode (with equalization):	40 Hz	39 Hz	52 Hz	52 Hz
Usable High-Frequency Limit:	6000 Hz	6000 Hz	7000 Hz	7000 Hz
Half-Space Reference Efficiency:	6.2 %	12.4 %	4.3 %	8.6 %
Long-Term Average Power Capacity per EIA Standard RS-426A: ²	200 watts	400 watts	200 watts	400 watts
Sound Pressure Level at 1 Meter, 1 Watt into Nominal Impedance, Pink Noise Band Limited to 100-800 Hz:	100.5 dB	104.5 dB	99.5 dB	103.5 dB
6-dB-Down Beamwidth for Possible Crossover Frequencies, Indicated Bands of Pink Noise, Long Enclosure Axis Vertical:				
500 Hz Horizontal:	118°	113°	155°	125°
800 Hz Horizontal:	111°	112°	106°	102°
500 Hz Vertical:	101°	49°	114°	58°
800 Hz Vertical:	135°	37°	113°	36°
Impedance – Nominal:	8 ohms	4 ohms	8 ohms	4 ohms
Minimum:	6.5 ohms	3.3 ohms	6.4 ohms	3.2 ohms
Driver(s) – Model:	EVM-15L Series II	EVM-15L Series II	EVM-12L Series II	EVM-12L Series II
Diameter:	15 in	15 in	12 in	12 in
Quantity:	One	Two	One	Two
Input Connections:	Screw terminals	Screw terminals	Screw terminals	Screw terminals
Gross Internal Box Volume:	99 liters (3.5 ft ³)	198 liters (7.0 ft ³)	34 liters (1.2 ft ³)	68 liters (2.4 ft ³)
Box Material and Finish:	Vinyl-clad particle board	Vinyl-clad particle board	Vinyl-clad particle board	Vinyl-clad particle board
Color:	Black	Black	Black	Black
Dimensions – Height:	68.6 cm (27.0 in)	100 cm (39.5 in)	54.6 cm (21.5 in)	85.1 cm (33.5 in)
Width:	45.7 cm (18.0 in)	57.2 cm (22.5 in)	35.9 cm (14.1 in)	42.2 cm (16.6 in)
Depth:	41.4 cm (16.3 in)	44.7 cm (17.6 in)	25.9 cm (10.2 in)	27.7 cm (10.9 in)
Net Weight:	28.1 kg (62 lb)	49.9 kg (110 lb)	19.5 kg (43 lb)	35.4 kg (78 lb)
Shipping Weight:	30.8 kg (68 lb)	55.3 kg (122 lb)	21.8 kg (48 lb)	39.9 kg (88 lb)

1. All acoustic measurements made in an anechoic environment with indicated bands of one-third-octave pink noise, unless otherwise noted.

2. The EIA test spectrum is shaped pink noise and is applied for eight hours; crest factor is 9 dB.

Electro-Voice Pioneered the Optimally Vented Low-Frequency System

Electro-Voice was the first to apply the advanced analyses of optimally vented woofer/ enclosure combinations of Australian researchers A. N. Thiele and Dr. R. H. Small. The resulting TL series has earned a reputation for tight, clean bass in a package of modest physical size. All TL systems use E-V's famous EVM™ Series II low-frequency transducers, for very high efficiency and power handling capacity (200 watts long-term average, per EIA Standard RS-426A).

TL806A and TL806D. The 1.2-cubic-foot TL806A is extremely compact, utilizing one EVM-12L Series II woofer. The TL806D is a dual-woofer version which increases directivity, efficiency, sensitivity and power handling capacity (see specifications). The low-frequency

performance of the 806 systems is essentially uniform to just above 70 Hz, fully adequate for high-quality speech reproduction as well as many music applications.

TL606A and TL606D. The larger 606 series utilizes the EVM-15L Series II 15-inch low-frequency transducers, with uniform frequency response to below 55 Hz. The dual-woofer TL606D has essentially the same directivity and efficiency as the classic single-woofer short-horn-loaded low-frequency systems which have heretofore been used extensively. Two TL606D's may be used side-by-side to form a 2 x 2 "quad" array for even greater efficiency and directivity, fully comparable to dual-woofer horn designs.

"Step-Down" Operation. All TL systems may be "stepped down" to an approximate B_6 Thiele alignment by covering one of the two system vents and applying the proper boost-and-cut equalization. This technique extends the low-frequency limit by about one-third of an octave without substantially reducing system maximum output ability. The appropriate equalization is available on the Electro-Voice XEQ-2 electronic crossover/ equalizer.

Enclosure Plans

Plans are available for custom building a variety of vented TL enclosures for 12-, 15-, and 18-in EVM Series II speakers, as well as the 30W 30-in sub-woofer. Some of the enclosures acoustically duplicate the complete systems described above. In addition, plans for two fully-horn-loaded sub-woofers, the TL4025 and TL4050, are available.

For these systems, low-frequency 3-dB-down points range from 26 to 83 Hz. Maximum output ranges from 3 to 144 acoustic watts. 1-watt/1-meter sensitivities range from 98.5 dB SPL to 108 dB SPL. Complete specifications are available from Electro-Voice.

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Full-Range Systems and Speakers



Specifications: ¹	PI12-2	PI15-3	Sentry IVB	PRO-12B
Frequency Response:	75-16,000 Hz	50-16,000 Hz	50-18,000 Hz	70-16,000 Hz
Half-Space Reference Efficiency (woofer section):	4.3%	6.2%	20%	2.0%
Long-Term Average Power Capacity at 8 Ohms, Shaped Pink Noise with 6-dB Minimum Crest Factor:	100 watts ² (24 hours)	100 watts ² (24 hours)	50 watts ³	60 watts ⁴ (8 hours)
Sound Pressure Level at 1 Meter, 1 Watt into 8 Ohms:	96.5 dB ²	97.5 dB ²	101.5 dB	97.5 dB ⁵
Horizontal Coverage Angle, 6 dB Down, Indicated Octave Bands of Pink Noise, Long Tweeter Axis Horizontal.⁶	130° (1000 Hz) 65° (2000 Hz) 70° (4000 Hz) 130° (8000 Hz) 112° (16,000 Hz)	155° (1000 Hz) 125° (2000 Hz) 90° (4000 Hz) 135° (8000 Hz) 105° (16,000 Hz)	113° (849 Hz) 130° (1697 Hz) 112° (3394 Hz) 116° (6788 Hz) 102° (13,576 Hz)	96° (1000 Hz) 80° (8000 Hz) 60° (16,000 Hz)
Vertical Coverage Angle, 6 dB Down, Indicated Octave Bands Pink Noise, Long Tweeter Axis Horizontal.⁶	120° (1000 Hz) 70° (2000 Hz) 50° (4000 Hz) 80° (8000 Hz) 53° (16,000 Hz)	155° (1000 Hz) 93° (2000 Hz) 78° (4000 Hz) 80° (8000 Hz) 48° (16,000 Hz)	180° (849 Hz) 128° (1697 Hz) 86° (3394 Hz) 70° (6788 Hz) 50° (13,576 Hz)	Not applicable ⁶
Crossover Frequencies:	3000 Hz	600 Hz & 4000 Hz	400 Hz & 3000 Hz ⁷	1800 Hz
Impedance – Nominal:	8 ohms	8 ohms	8 ohms	8 ohms
Impedance – Minimum:	6.6 ohms	5 ohms	8 ohms	6.5 ohms
Transducer Complement – Tweeter:	ST350B	ST350B	ST350B	Super-Dome™
Midrange:	—	VMR™	1824M on SM120A horn	—
Woofer:	EVM-12L Series II	EVM-15L Series II	EVM-12L Series II (two)	12 in
Tweeter Protection:	Hi-Frequency Auto Limiter	Hi-Frequency Auto Limiter	STR	None
Input Connections:	Screw terminals	Screw terminals	Push terminals	Push terminals
Box Material and Finish:	Vinyl-clad particle board	Vinyl-clad particle board	Painted plywood	—
Color:	Black	Black	Black	Black
Dimensions – Height:	53.3 cm (21 in)	61.6 cm (24.3 in)	129 cm (50.8 in) ⁸	—
Width:	46.4 cm (18.3 in)	71.1 cm (28 in)	70.5 cm (27.8 in)	—
Overall Depth:	29.2 cm (11.5 in)	34.7 cm (13.7 in)	52.4 cm (20.6 in)	15.2 cm (6 in)
Overall Diameter:	—	—	—	31.0 cm (12.2 in)
Net Weight:	—	—	67.0 kg (148 lb)	5.4 kg (12 lb)
Shipping Weight:	29.9 kg (66 lb)	49.0 kg (108 lb)	—	—

1. All acoustic measurements made in an anechoic environment with indicated bands of one-third-octave pink noise, unless otherwise stated.

2. Pink-noise input spectrum rolled off at 6 dB per octave below 100 Hz and above 10,000 Hz.

3. Pink-noise input spectrum rolled off at 12 dB per octave below 40 Hz and 6 dB per octave above 4000 Hz. High-frequency attenuator in Number 1 (flat) position. Power capacity increases with increasing attenuation (75 watts in Number 2 position; 125 watts in Number 3 position).

4. Pink-noise input spectrum rolled off at 12 dB per octave below 40 Hz and 6 dB per octave above 4000 Hz.

5. Average, octave bands of pink noise, 100-5000 Hz.

6. Does not apply to PRO-12B, whose dispersion is symmetrical.

7. The Sentry IVB may be bi-amplified at a 400-to-450-Hz crossover frequency.

8. In normal configuration (as illustrated).

PI12-2 and PI15-3 Integrated Systems

The PI12-2 and PI15-3 are wide-angle, wide-range systems of moderately high efficiency. They are applied where the directivity control, higher efficiency, and complexity of a component-based point source or cluster are not required. PI systems are used as the "main speakers" in churches, skating rinks, lounges, and small auditoriums. They are also widely used as effects and side-fill monitor speakers in theatrical and entertainment venues.

Each system employs a high-power-capacity/maximum-efficiency EVM Series II low-frequency speaker. Both systems also feature the ST350B tweeter with wide 120° horizontal dispersion over its entire operating range, so that program quality is assured throughout the audience. The ST350B is protected from excessive power inputs by E-V's Hi-Frequency Auto Limiting circuit which virtually eliminates the possibility of tweeter damage.

The PI15-3 also has E-V's exclusive VMR™ vented midrange speaker. VMR is the only cone midrange driver available which not only matches the high sound pressure levels available from E-V's Thiele-designed bass cabinets, but also complements the uniform dispersion of the ST350B tweeter. The result is a redefinition of the clarity and natural sound quality possible in a complete, full-range speaker system. In fact, the PI15-3 has become a standard against which other competitive systems are compared.

Sentry IVB All-Horn-Loaded System

The Sentry IVB is a wide-range three-way speaker system for use where the maximum efficiency of an all-horn-loaded design is necessary, along with a wide, uniform coverage angle (120° x 80°). Application is similar to that of the PI15-3 but with a 3.5 dB sensitivity advantage and greater low- and mid-frequency power handling capacity. These differences make the Sentry IVB useful in behind-the-screen cinema applications, when a desire for improved theater sound renders traditional speakers obsolete.

The LFSA low-frequency section is a folded horn design incorporating two EVM-12L Series II 12-inch speakers. Unlike the "short horns" used in classic theater-type speakers, the LFSA provides full horn loading across its entire operating range. In a 1/2-to-1/4-space environment, the hyperbolic-exponential taper (T = .6) maintains linear output to just above the theoretical cut-off frequency of 50 Hz.

The HFSA high-frequency section includes mid- and high-range reproducers and the system crossover network. Midrange is reproduced by an 1824M driver mounted on the SM120A horn. The SM120A is a traditional radial design, except that its "neckless throat" and sufficiently wide mouth maintain a constant coverage angle of 120° in the horizontal plane over the entire frequency range above the crossover frequency of 400 Hz. The ST350B tweeter matches the 120° coverage over its entire operating range, and, in combination with the midrange horn and driver, provides a vertical coverage angle that is never less than 70° up to and including the 8,000-Hz octave band (50° in the 16,000-Hz band). The ST350B is protected from excessive peak and long-term-average power inputs by the STR tweeter protector. The integral crossover network provides crossover frequencies of 400 and 3500 Hz, as well as the frequency tailoring necessary to produce uniform axial frequency response. This response and the unusually uniform coverage angle provide a level of performance not typically associated with theater-type speaker systems. The Sentry IVB may be bi-amplified at a 400-to-450-Hz crossover frequency.

The LFSA, HFSA, ST350B tweeter, SM120A horn, and 1824M driver are all available separately.

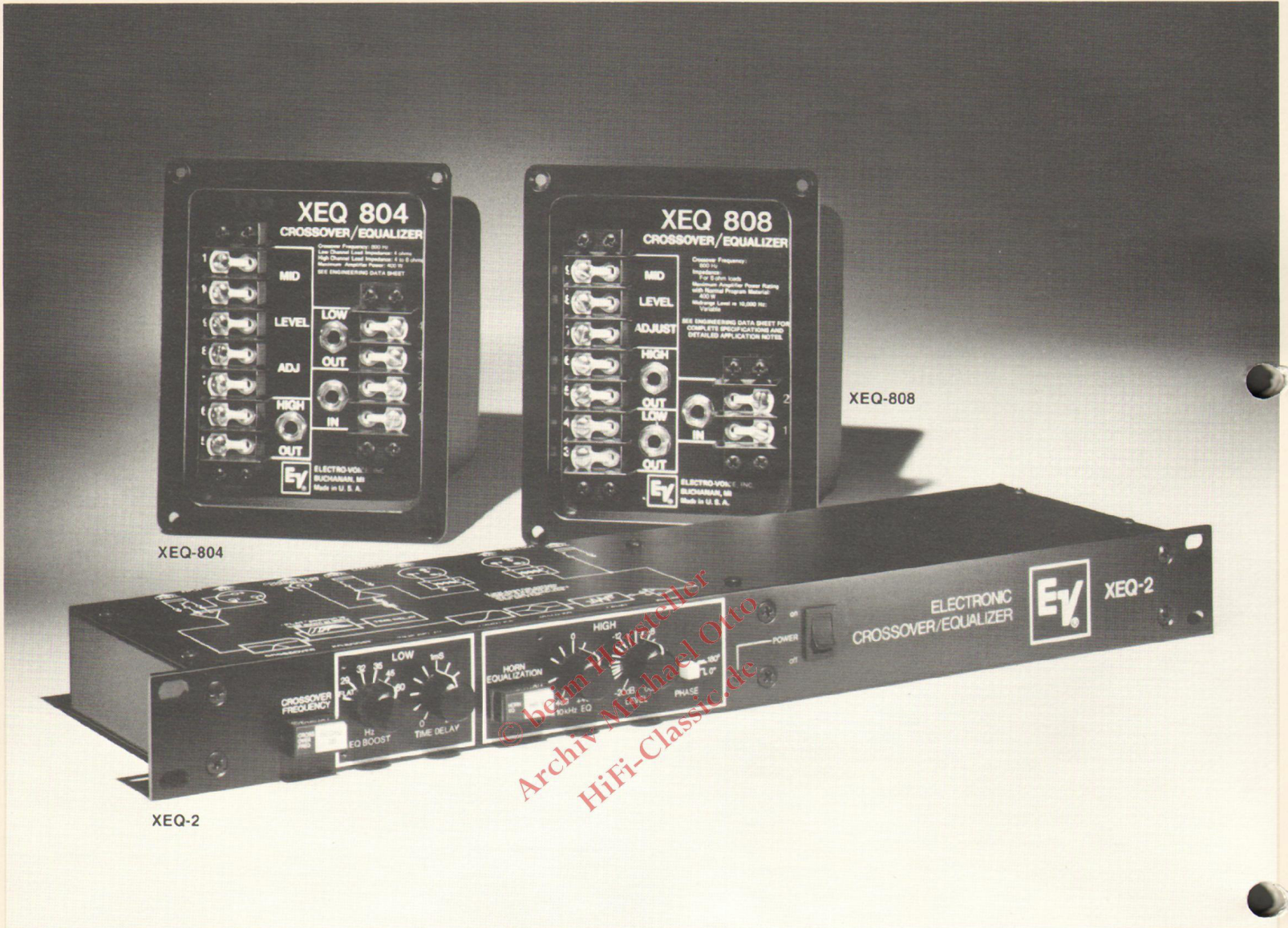
PRO-12B Ceiling Speaker

The PRO-12B is a 12-inch, two-way ceiling speaker designed for high-performance distributed systems. Typical applications include arenas, gymnasiums, ballrooms, meeting rooms, and churches. The PRO-12B fills an important void between low-cost, low-output 8-inch units and expensive 12- and 15-inch speakers. The PRO-12B's Super-Dome™ tweeter is a high-output dome radiator capable of sustaining 25 watts of continuous power above crossover, with linear axial frequency response to beyond 15,000 Hz. Additionally, the Super-Dome provides a coverage angle that is significantly more uniform than that of typical 12- and 15-inch designs, regardless of price. This means the virtual elimination of "hot spots" below system speakers.

The PRO-12B will handle 60 watts of shaped pink noise on a continuous basis. With unclipped program material, the PRO-12B may be safely operated with amplifiers rated up to 120 watts average sine wave power ("RMS"). Even under adverse conditions of substantial clipping of program peaks and sustained feedback, the PRO-12B is highly resistant to damage when driven with amplifiers or constant-voltage transformers in the 30-watt range.



Crossover/Equalizer Networks



Specifications:	XEQ-804	XEQ-808
Channel Configuration:	Monaural	Monaural
Crossover Frequency:	800 Hz	800 Hz
Attenuation Rate Outside of Crossover Region:	12 dB per octave (low-pass output); 18 dB per octave (high-pass output)	12 dB per octave (low-pass output); 18 dB per octave (high-pass output)
Nominal Load Impedance – Low Channel:	4 ohms	8 ohms
High Channel:	4-8 ohms ¹	8 ohms
Equalization at 10,000 Hz:	Approximately 10 dB above 1000-Hz reference (varies slightly with high- frequency attenuation adjustment)	Approximately 12 dB above 1000-Hz reference (varies slightly with high- frequency attenuation adjustment)
High-Frequency Attenuation (1000 Hz):	9-16 dB, adjustable in six steps	9-16 dB, adjustable in five steps
Insertion Loss, Low-Frequency Channel:	.7 dB typical	.7 dB typical
Maximum Safe Amplifier Power Rating with Typical Program Material (maximum voltage input not to be exceeded):	400 watts continuous sine wave	400 watts continuous sine wave
Long-Term Average Power Handling Capacity, Pink Noise Shaped per EIA Standard RS-426A:	100 watts	100 watts
Maximum Input Voltage:	± 80 volts peak	± 80 volts peak
Circuit Type – Frequency Division:	Second-order L-C	Second-order L-C
High-Frequency Equalization and Attenuation:	Adjustable series capacitance	Adjustable series capacitance
Connections:	Screw terminals in parallel with ¼-in phone jacks	Screw terminals in parallel with ¼-in phone jacks
Overall Dimensions – Height:	178 mm (7 in)	178 mm (7 in)
Width:	140 mm (5.5 in)	140 mm (5.5 in)
Depth:	164 mm (6.4 in)	164 mm (6.4 in)
Net Weight:	3.4 kg (7.6 lb)	3.1 kg (6.9 lb)
Shipping Weight:	3.7 kg (8.2 lb)	3.4 kg (7.6 lb)

1. The high-frequency channel accommodates one 4- or 8-ohm driver or two 8-ohm drivers.

Networks Designed Expressly for Constant-Directivity Horns and Maximum-Efficiency Drivers

All maximum-efficiency drivers placed on constant-directivity horns require equalization above about 3000 Hz to achieve flat overall frequency response. Only Electro-Voice crossover networks provide equalization precisely tailored to the characteristics of DH drivers and HR horns. Thus, the XEQ crossover/equalizers provide essentially flat response within the beamwidth of system high-frequency horns, without use of external equalization. This complementary "total systems" approach is convenient with the traditional selection of horns, because each horn type provides its own unique "acoustic equalization" of driver response as the horn coverage angle departs from its rated value.

Use of an XEQ crossover/equalizer means that separate equalizers – such as the one-third-octave, 26-band units commonly employed in high-quality systems – are not forced to compensate for overall transducer response characteristics. Instead, equalizers may be used for the more subtle requirements dictated by specific component configuration and room characteristics. In simple systems, the basically flat free-field response provided by the XEQ series can eliminate the need for a separate equalizer altogether. This can be important in bringing high-quality "pro sound" performance to venues where the cost was previously prohibitive.

Passive, High-Level Networks. The XEQ-804 and XEQ-808 are designed for placement between a single power amplifier channel and the low- and high-frequency speaker systems. The XEQ-804 matches one or two E-V horn/driver combinations to 4-ohm, dual-woofer systems like the TL806D and TL606D. The XEQ-808 makes the same match to 8-ohm, single-woofer systems like the TL806A and TL606A.

Equalization and attenuation of horn/driver output to the level of the chosen low-frequency system are achieved by depressing horn mid-band output without materially affecting the level at 10,000 Hz and above. This frequency tailoring is achieved without resistive losses. The XEQ-804 and XEQ-808 may be used with power amplifiers rated at up to 400 watts continuous sine wave or "RMS" output.

Active, Low-Level Network. The XEQ-2 is a single-channel (monaural) crossover/equalizer for bi-amplification. In bi-amplified systems, crossover is achieved before power amplification so that a separate amplifier channel is used for the low- and high-frequency speaker systems. Bi-amplification allows for the most flexible and accurate crossover/equalization, facilitates output level adjustments of individual cluster components, and can reduce system distortion when a system is operated close to its maximum capacity.

The particular crossover and equalization characteristics of the XEQ-2 are set by plug-in module. Three crossover-frequency modules are supplied with the XEQ-2. The X500 and X800 modules provide frequencies of

500 and 800 Hz. The BMK blank module permits construction of any other frequency between 100 and 8,000 Hz. In addition, X125, X1500, X3500 and X7000 modules are available.

Horn/driver equalization modules must be ordered separately and vary with the particular horn chosen. In complex systems employing different HR horns, the module for the horns covering the near field should be chosen. The XEQ-2 is shipped with a "flat" module that provides flat response to the high-frequency driver above the chosen crossover frequency. A continuously variable control on the XEQ-2 provides for additional high-frequency tailoring above 5,000 Hz, ± 4 dB at 10,000 Hz.

In addition to a traditional switch for reversing the polarity of the high-frequency output, the XEQ-2 features a unique variable time-delay circuit in the low-frequency output. At typical crossover frequencies, the delay can be varied between about 0 and 2 milliseconds. This permits precise smoothing of frequency response in the crossover region – not possible with conventional networks.

The low-frequency output of the XEQ-2 provides switchable low-frequency contouring for "step-down" operation of Electro-Voice TL vented bass speaker systems. The contouring includes a high-pass filter with 12-dB-per-octave slope below the peak-boost frequency for removing subsonic energy below the lowest usable speaker frequency. A similar high-pass filter is also part of the Flat (no contouring) switch position, with a 3-dB-down point of 30 Hz.

Specifications: XEQ-2	
Channel Configuration:	Monaural
Crossover Frequency Range:	100-8000 Hz (determined by module ¹)
Attenuation Rate Outside of Crossover Region:	18 dB per octave ²
Plug-In Horn/Driver Equalization Modules, Normally Supplied:	EQF, for flat electrical response above crossover
Available:	EQA (HR90 horn), EQB (HR120, SM120A horns), EQC (HR40, HR60 horns), EQD (HR4020A, HR9040A horns), EQE (HR6040A horn), all for essentially flat on-axis free-field acoustic response above crossover
Continuously-Variable High-Frequency Equalization:	± 4 dB at 10,000 Hz, Q = 3
High-Frequency Channel Level Control:	0 to -20 dB relative to low-frequency channel
High-Frequency Channel Relative Phase:	Switchable, 0° or 180°
Low-Frequency Equalization for "Step-Down" Operation of TL Vented Bass Speaker Systems:	Second-order under-damped filter with switchable plus-6 dB peak boost frequencies of 29, 32, 35, 45, and 60 Hz, plus "flat" with a high-pass f_3 of 30 Hz
Low-Frequency Channel Delay, Adjustable:	25 μ sec to 2 msec at 100 Hz
Overall Gain (controls flat):	0 dB into high-impedance load
Total Harmonic and Intermodulation Distortion (controls flat) – Typical:	.02%
Maximum at 20 kHz, +20 dBm:	.1%

1. The XEQ-2 is supplied with the X500 (500 Hz), X800 (800 Hz), and BMK (blank module kit for construction of other crossover frequencies in

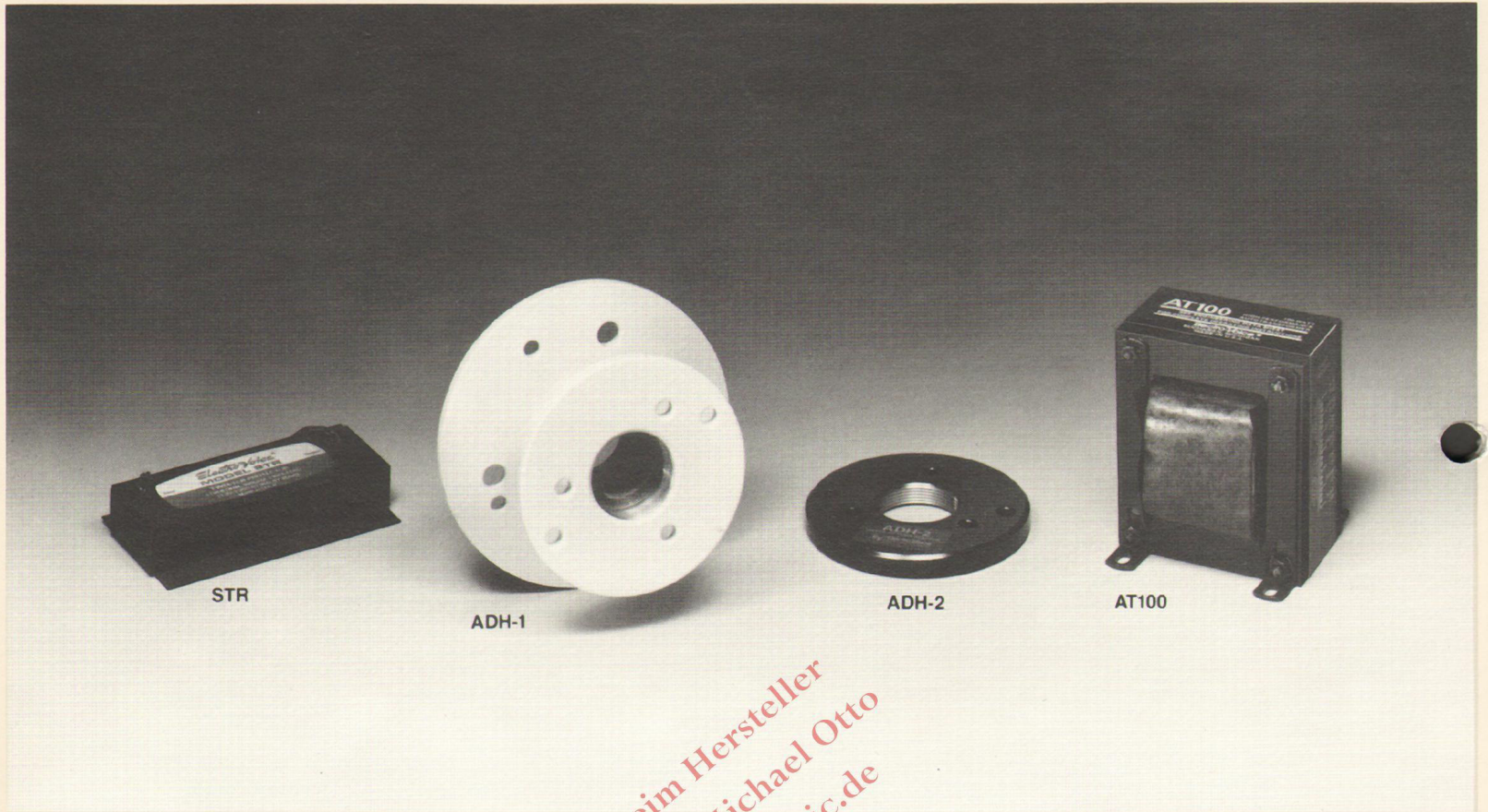
the 100-8000-Hz range). The X125, X1500, X3500, and X7000 modules are also available.

Specifications: XEQ-2	
Frequency Response (sum of outputs, controls flat):	± 0.5 dB 30-20,000 Hz
Noise Output (20-20,000 Hz bandwidth):	-90 dBV maximum (-88 dBm)
Maximum Output Level:	+18 dBV (+20 dBm)
Transient Performance:	Not limited by slew rate or power bandwidth over 20-20,000 Hz under any normal operating condition
Input Configuration:	Balanced or unbalanced, user selectable
Output Configuration:	Unbalanced; balanced and isolated with optional accessory TRB-1 transformer pair
Input Impedance, Bridging – Unbalanced:	15,000 ohms
Balanced:	30,000 ohms
Output Internal Impedance:	47 ohms
Minimum Load Impedance:	600 ohms
Mounting:	Standard 19-in rack panel, 1 $\frac{3}{4}$ -in high, 5-in depth behind panel
Connections:	3-pin professional connectors (female on input, male on output) in parallel with $\frac{1}{4}$ -in phone jacks
Power Requirements:	90-120 volts, 50/60 Hz, 8 watts, maximum
Overall Dimensions – Height:	44 mm (1.7 in)
Width:	483 mm (19 in)
Depth:	124 mm (4.9 in)
Net Weight:	2.2 kg (4.7 lb)
Shipping Weight:	2.7 kg (6 lb)

2. Other filter types may be constructed, with high and low channels independently chosen.



Accessories



STR Tweeter Protector

Installed between the power amplifier (or high-level crossover output) and its speaker load, the STR will interrupt the signal when the continuous power to the speaker exceeds 5 watts at 8 ohms (6.3 volts). For shorter time durations, such as would be the case for program peaks, the interrupting powers are higher (e.g., approximately 8.4 watts at 32 milliseconds and 18 watts at 12 milliseconds). These higher short-term power inputs are generally not damaging and allow realistic reproduction of program peaks. When the input voltage returns to a safe level, the signal is restored. Although designed for tweeters or other speakers with 5-watt long-term average power capacities, the STR may be modified for use with compression drivers of much higher power capacity. Write to Electro-Voice for *Pro Sound Facts No. 3*, available at no charge. STR shipping weight is .5 kg (1 lb).

ADH-1 Driver-to-Horn Adaptor

The ADH-1 matches most bolt-on drivers with 25-mm (1 in) throats and all screw-on drivers with $1\frac{3}{8}$ " - 18 mounting threads to Electro-Voice HR horns, all of which have 33-mm (1.3 in) throats. An ADH-1 is required to match a DH1506 driver to an HR horn. Net weight is .4 kg (15 oz); shipping weight is .6 kg (1.3 lb).

ADH-2 Driver-to-Horn Adaptor

The ADH-2 matches any screw-on driver with $1\frac{3}{8}$ " - 18 mounting threads (such as the Electro-Voice DH1506) to horns or horn adaptors with a 25-mm (1 in) nominal throat diameter and two- or three-hole mounting-bolt patterns. Shipping weight is .5 kg (1 lb).

AT100 100-Watt Autotransformer

The AT100 is a wide-range, low-distortion, high-power-capacity device for a broad range of impedance-matching applications. Where dc isolation between windings is not required, an autotransformer provides lower insertion loss than the typical dual-winding transformer due to tighter magnetic coupling and lower coil resistance. Although nominally rated at 100 watts, the AT100 may be operated at peak levels far in excess of 100 watts, at low distortion, due to its massive core and hefty construction. The AT100 may be used in both step-up and step-down applications. Taps are common, 4 ohms, 8 ohms; 16 ohms, 50 ohms (100 watts at 70.7 volts), 70.7 ohms (70.7 watts at 70.7 volts), and 100 ohms (50 watts at 70.7 volts). Overall dimensions are 95 mm (3.8 in) high, 79 mm (3.1 in) wide, and 89 mm (3.5 in) deep. Shipping weight is 2.7 kg (7 lb).

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WARRANTIES (Limited)

Electro-Voice Professional Sound Reinforcement Loudspeakers and accessories are guaranteed for five years from date of original purchase against malfunction due to defects in workmanship and materials. If such malfunction occurs, unit will be repaired or replaced (at our option) without charge for materials or labor if delivered prepaid to the proper Electro-Voice service facility. Unit will be returned prepaid. Warranty does not cover finish or appearance items or malfunction due to abuse or operation at other than specified conditions. Repair by other than Electro-Voice or its authorized agencies will void this guarantee.

Electro-Voice Professional Sound Reinforcement Electronic Products are guaranteed for two years from date of original purchase against malfunction due to defects in workmanship and materials. If such malfunction occurs, unit will be repaired or replaced (at our option) without charge for materials or labor if delivered prepaid to the proper Electro-Voice service facility. Unit will be returned prepaid. Warranty does not cover finish or appearance items or malfunction due to abuse or operation at other than specified conditions. Repair by other than Electro-Voice or its authorized service agencies will void this guarantee.

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Electro-Voice engineering continually improves existing products, as well as creating new ones. Thus specifications given in this brochure are subject to change without notice.