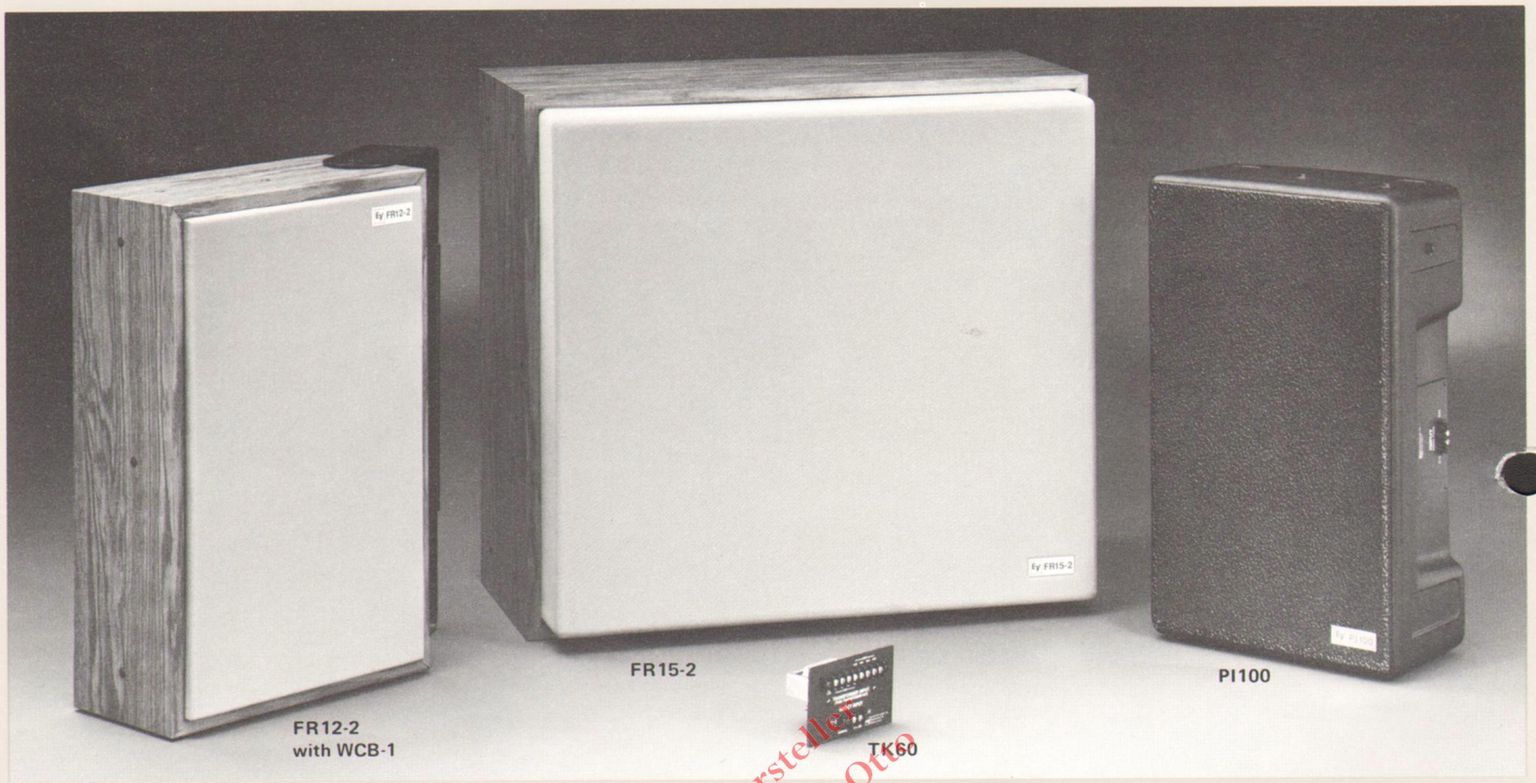
Electro-Voice

Professional Sound Reinforcement Products

New Products Supplement

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° × 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° × 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″ × 9″ Direktor™ which defines the 100° × 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 a[illegible] 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.

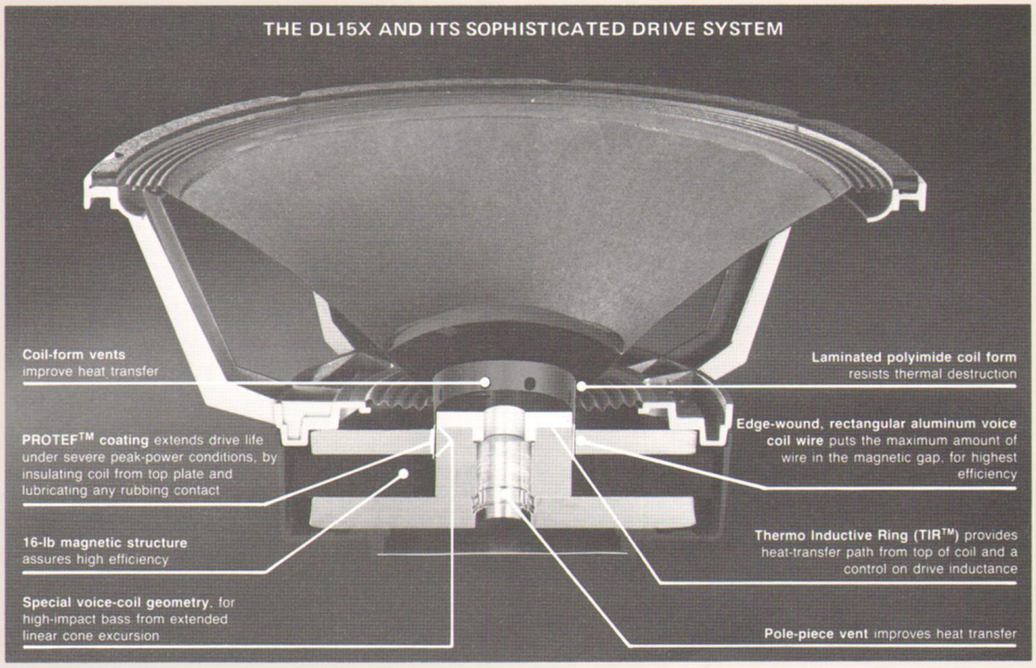
FR15-2

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° × 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° × 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 Systems[1]

	FR12-2	PI100	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 × vertical):[3]	100° × 100°	100° × 100°	90° × 40°
Horizontal and Vertical Coverage Angles, 6 dB Down, One-Third-Octave Bands of Pink Noise— 1,000 Hz:[4]	105°	105°	102° × 112°
2,000 Hz:	85°	85°	83° × 95°
4,000 Hz:	100°	100°	102° × 52°
8,000 Hz:	87°	87°	94° × 38°
16,000 Hz:	52°	52°	82° × 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° × 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 PI100, horizontal for FR15-2.

Low-Frequency Reproducer[1]

	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[4]
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 m³ (8.1 ft³)
S_d (effective diaphragm area):	0.086 m² (133 in.²)
X_{max} (zero-to-peak linear displacement of diaphragm):[7]	4.1 mm (0.16 in.)
$P_{e\ (max)}$ (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.

Electro-Voice® a gulton company
600 Cecil Street, Buchanan, Michigan 49107
8234 Doe Avenue, Visalia, California 93277
Electro-Voice Div., 345 Herbert St., Gananoque, Ontario
Electro-Voice, S.A., Romerstrasse 3, 2560 Nidau, Switzerland
Electro-Voice, Ltd., 6F No. 2 Taro Building, 2-10 Yotsuya, Shinjuku-ku, Tokyo, Japan 160

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.