

Electro-Voice®

a MARK IV company

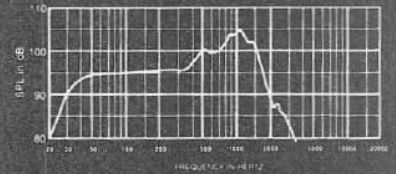


FIGURE 1
Axial Frequency Response, 1 Watt/1 Meter
10 Cubic Foot Enclosure

EVX-180 EVX-184 18-Inch Low-Frequency Reproducers

SPECIFICATIONS

Power Handling:
1000 watts continuous program

Voice Coil Diameter:
100 mm (4 in.)

**Sensitivity (SPL/1 W/1 M),
100-800-Hz Average:**
96 dB

Impedance,
EVX-180: 8 ohms
EVX-184: 4 ohms

Frequency Response:
20-1500 Hz

Highest Recommended Crossover:
500 Hz

Magnet Assembly Weight:
8.3 kg (18.3 lbs)

THIELE-SMALL PARAMETERS

f_s : 20 Hz

R_e : 5.0 ohms (EVX-180)
2.7 ohms (EVX-184)

Q_{ts} : 0.220

Q_{ms} : 4.71

Q_{es} : 0.231

V_{as} : 922 L (32.7 cu. ft.)

S_D : 0.125 sq. m (194 sq. in.)

X_{max} : 10.2 mm (0.40 in.)

Displacement Limit:
40.6 mm (1.6 in.) peak to peak

η_o : 3.08%

P_e : 600 watts EIA RS-426A
500 watts continuous sine wave

DESCRIPTION

The EVX-180 series low-frequency transducers are designed for professional sound reinforcement or studio monitoring applications that require maximum output with low distortion.

EVX-180 and EVX-184 woofers provide unprecedented power capacity, linearity, and excursion made possible by the HeatWick™ total-thermal-engineering design. The proprietary HeatWick design actually "wicks" heat away from the voice coil, significantly increasing power handling and long-term-reliability. A special frame extension and elongated pole piece provide a metal surface with close proximity to the entire length of the voice coil, providing a major heat-transfer path. Also, the 100-mm (4-in.) diameter voice coil is longer than conventional medium-efficiency woofers to give additional power handling and virtually eliminate dynamic-range power compression.

Additionally, a Flux Demodulation Device (FDD™) reduces distortion in the critical midband by providing a "short circuit" effect to prevent amplifier-signal modulation of the static magnetic field. To further increase reliability, PROTEF™ Teflon® coating is applied to the internal diameter of the FDD and top plate. PROTEF lubricates any rubbing contact and electrically insulates the coil from the FDD and top plate to guard against violent short-term power peaks.

A ribbed carbon-fiber composite cone with an extremely high stiffness-to-weight ratio gives the EVX-180 series increased resistance to cone collapse and deformation, without sacrificing efficiency.

*Patent #4,547,632

FEATURE HIGHLIGHTS

- **HeatWick™ Design**
Provides advanced thermal engineering to "wick" heat away from the voice-coil for increased power handling and reliability.
- **Extended-Length 100-mm (4-in.) Voice Coil**
Has nearly twice the surface area of any other woofer to virtually eliminate dynamic-range power compression.
- **Carbon-Fiber Composite Cone**
For added protection against cone collapse and breakup, without adding efficiency-robbing weight.
- **Flux Demodulation Device (FDD™)**
Considerably reduces midband distortion by preventing amplifier-signal modulation of the static magnetic field.
- **Rubber Mounting-Flange Gasket**
Provides a reusable seal for front or rear mounting, completely surrounding the frame flange.
- **1,000-Watt Continuous Program**
Power capacity, without efficiency sacrifice, for extremely high output with low distortion.

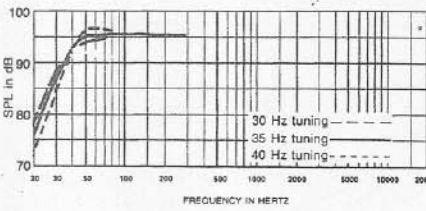


FIGURE 2A — EVX-180 and 184 Single-Driver Low-Frequency Performance: 223-L (8-ft³) Enclosure

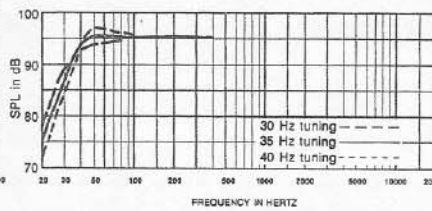


FIGURE 2B — EVX-180 and 184 Single-Driver Low-Frequency Performance: 283-L (10-ft³) Enclosure

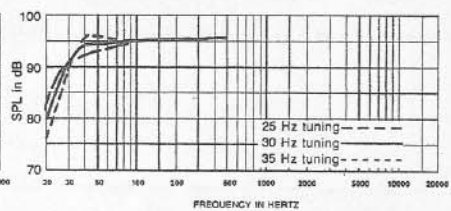


FIGURE 2C — EVX-180 and 184 Single-Driver Low-Frequency Performance: 336-L (12.5-ft³) Enclosure

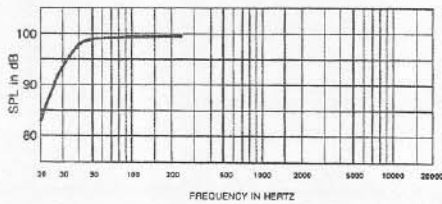


FIGURE 2D — EVX-180 and 184 Multiple-Driver Low-Frequency Performance: 2 Drivers in a 566-L (20-ft³) Box or 2 283-L (10-ft³) Boxes in Close Proximity Tuned to 30 Hz

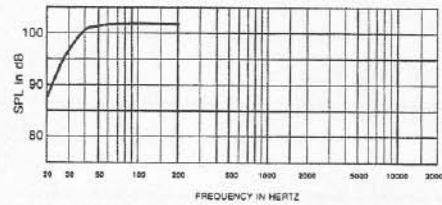


FIGURE 2E — EVX-180 and 184 Multiple-Driver Low-Frequency Performance: 4 Drivers in a 1132-L (40-ft³) Box or 2 566-L (20-ft³) Boxes in Close Proximity Tuned to 28 Hz

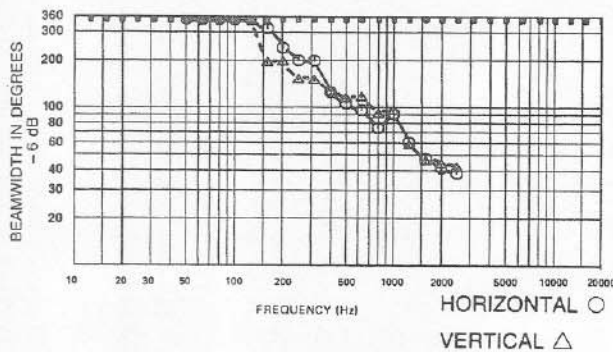


FIGURE 3 — Beamwidth vs. Frequency EVX-180/TL3512 in a 255-L (9.0-ft³) Enclosure

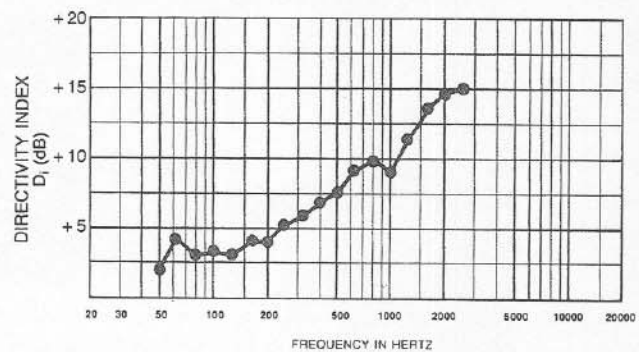


FIGURE 4 — Directivity Index vs. Frequency EVX-180/TL3512 in a 255-L (9.0-ft³) Enclosure

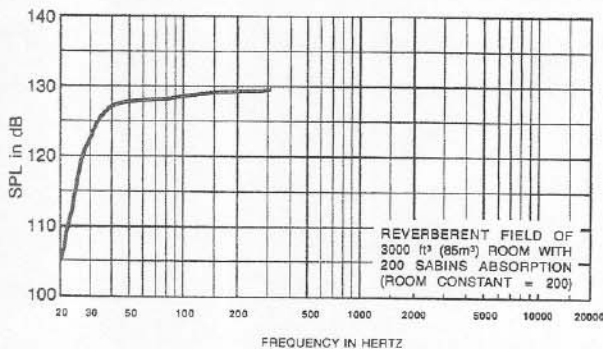


FIGURE 5 — Theoretical Low-Frequency Maximum Acoustic Output vs. Frequency 283-L (10-ft³) Enclosure Tuned to 30 Hz

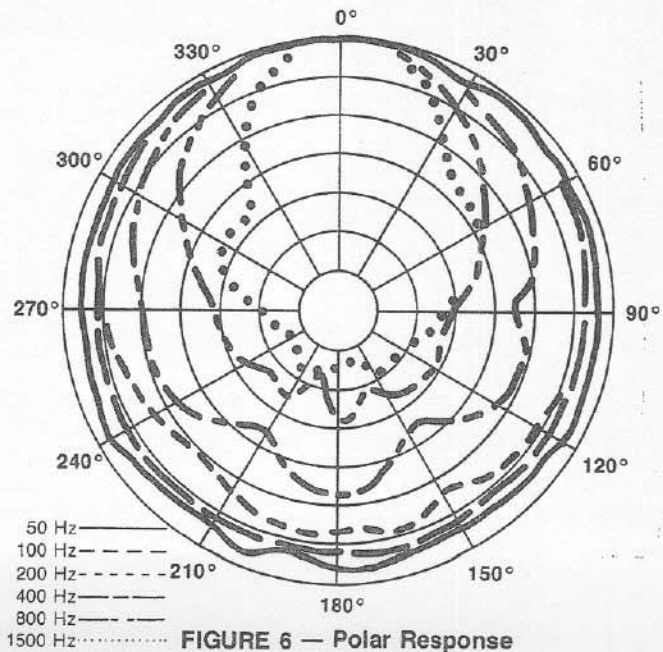


FIGURE 6 — Polar Response

DIRECTIONAL PERFORMANCE

The directional characteristics of the EVX-180 and EVX-184 in the TL3512 256-L (9-ft³) vented enclosure were measured by running a set of polar responses in EV's large anechoic chamber. The test signal was octave-band-limited pseudo-random pink noise centered at the ISO standard frequencies.

The curves show horizontal (side-to-side) dispersion when the enclosure's long axis is vertical. The vertical (up-and-down) polar responses deviate only slightly from the horizontal responses due to box geometry. Typical data is provided in Figures 3 and 4 which indicate 6-dB-down beamwidth versus frequency and directivity factor, respectively, for an EVX-180 or EVX-184 in the TL3512 enclosure.

POWER HANDLING TEST

To our knowledge, Electro-Voice was the first U.S. manufacturer to develop and publish a power test closely related to real-life conditions. First, we use a random noise input signal because it contains many frequencies simultaneously, just like real voice or instrument program. Second, our signal contains more energy at extremely high and low frequencies than typical actual program, adding an extra measure of reliability. Third, the test signal includes not only the overall "long-term average" or "continuous" level — which our ears interpret as loudness — but also short-duration peaks which are many times higher than the average, just like actual program. The long-term average level stresses the speaker thermally (heat). The instantaneous peaks test mechanical reliability (cone and diaphragm excursion).

Specifically, the EVX-180 and EVX-184 are designed to withstand the power test described in EIA Standard RS-426A. The EIA test spectrum is applied for eight hours. To obtain the spectrum, the output of a white noise generator (white noise is a particular type of random noise with equal energy per bandwidth in Hz) is fed to a shaping filter with 6-dB-per-octave slopes below 40 Hz and above 318 Hz. When measured with the usual constant-percentage-bandwidth analyzer (one-third octave), this shaping filter produces a spectrum whose 3-dB-down points are at 100 Hz and 1200 Hz with a 3-dB-per-octave slope above 1200 Hz. The signal has a 6-dB crest factor. This procedure provides a rigorous test of both thermal and mechanical failure modes.

The EVX-180 and EVX-184 have also been power tested with a two hour sine wave at minimum impedance so that competitive comparisons can be made using consistent methods. Continuous program power is defined as 3-dB above (double) the continuous sine-wave power rating.

RECOMMENDED ENCLOSURES

The most extended, lowest distortion and best controlled bass performance is usually realized in properly designed vented enclosures. In such designs, the vent, or port, actually provides the lowest octave of output. The vent is driven to full acoustic output by a relatively small motion of the speaker cone itself, acting through the air contained within the enclosure. The excursion of the EVX-180 and EVX-184 at these frequencies is much reduced compared to sealed or open back enclosures, directly reducing harmonic distortion and the possibility of speaker "bottoming." Several specific vented-enclosure recommendations are on the previous page. Alternate tunings are given so that designers can tailor the low-frequency response to their specific needs. Figure 5 shows the maximum acoustic power output versus frequency. The maximum output is limited by either: 1) the thermal, power handling capacity, or, 2) the speaker's maximum cone excursion capabilities, whichever occurs first. Also provided are recommended enclosures for multiple driver configurations.

STEP-DOWN OPERATION

For extra-low bass use, the vent area can be reduced by one-half, thereby tuning the enclosure to the "step down" mode. In step-down, the tuning frequency is reduced by half an octave (a factor of 0.7). The resulting alignment is then equalized for flat response. This procedure results in one-half octave lower bass without any excursion penalty.

ARCHITECTS' AND ENGINEERS' SPECIFICATIONS

The low-frequency transducer shall have a nominal diameter of 460 mm (18 in.), overall depth not greater than 198 mm (7.92 in.), and weight no more than 11 kg (25 lbs). The frame shall be made of die-cast aluminum to resist deformation. The magnetic assembly shall have an extended pole-piece to reduce inductive variances with excursion, and provide a symmetrical magnetic field at the voice coil gap. Two aluminum rings shall encircle the pole piece above and below the magnetic gap, and shall have internal diameters concentric with the internal diameter of the steel top-plate. The upper ring shall be part of the loudspeaker frame. Both rings act to reduce flux modulation and provide a heat-transfer path from the outer diameter of the voice coil. The inner diameter of the steel top plate and the lower aluminum ring shall be Teflon® coated.

The voice coil shall be 100 mm (4 in.) in diameter and 28 mm (1.1 in.) in winding length, and shall be made of edgewound aluminum ribbon. When centered in the magnetic gap, the voice coil

shall produce a force of not less than 20.2 Newtons (Tesla-Ampere-Meters) with a dc current of 1 ampere.

Performance specifications of a typical production unit shall be as follows: Measured sensitivity [SPL at 1 m (3.3 ft.) with 1-watt input, averaged between 100-800-Hz pink noise] shall be at least 96 dB. The half space reference efficiency shall be at least 3.0%. The usable frequency response shall be 20 Hz to 1500 Hz, and the nominal impedance shall be 8 ohms. The rated power for the loudspeaker shall be 1000 watts normal program material.

The low-frequency transducer shall be the Electro-Voice EVX-180. A low-frequency transducer as described above with a 4-ohm nominal impedance and an axial voice-coil force of 14.2 Newtons, with 1 ampere of current, shall be the Electro-Voice EVX-184 model.

AES SPECIFICATIONS

The following specifications are in accordance with the "AES Draft Recommended Practice for Specification of Loudspeaker Components Used in Professional Sound Reinforcement Systems — 1983."

Dimension and Weight,

Outer Diameter:

46 cm (18.2 in.)

Depth:

20 cm (7.92 in.)

Bolt Hole Diameter:

7.1 mm (0.281 in.)

Net Weight:

11.3 kg (25 lb)

Shipping Weight:

14 kg (31 lb)

Mounting:

The EVX-180 and EVX-184 may be front- or rear-mounted against either surface of the mounting flange and requires a 422-mm (16.6-in.) diameter cutout and a 441-mm (17.38-in.) bolt circle. Normal fasteners up to 6 mm (¼ in.) will fit through the eight holes in the frame. Front mounting is simplest using the optional SMH-1 speaker mounting kit.

Electrical Connections:

The EVX-180 and EVX-184 are fitted with a pair of chrome-plated frame-mounted connectors with color-coded ends. Electrical connection is made by pushing down, inserting wire completely through the rectangular slot and releasing pressure. One conductor of #9 AWG stranded, #8 AWG solid, a pair of twisted #15 AWG stranded or a pair of #14 AWG solid conductors will fit. A positive electrical signal applied to the red (+) terminal will displace the cone away from the magnet, thus producing a positive acoustic pressure.

ADDITIONAL DESCRIPTIVE INFORMATION:

- Voice-Coil Material:
Aluminum
- Voice-Coil Insulation:
Polyimide, 220 degree C rating
- Coil Form:
Polyimide
- Magnet Frame:
Cast aluminum
- Thermal Rise after Power Test:
82 degrees C (147 degrees F)
- Recommended Enclosures:
7-13 cubic foot (198 L-368 L)
- Magnet Plating:
Bright cadmium

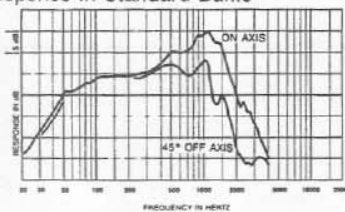
Physical Constants,

- Effective Piston Diameter:
398 (15.7 in.)
- Total Moving Mass:
0.125 kg
- Voice-Coil Winding Depth:
28 mm (1.1 in.)
- Top Plate Thickness at Voice Coil:
8.9 mm (0.35 in.)
- Z_{min}:
7 ohms (EVX-180)
4 ohms (EVX-184)
- Bl Factor:
20.3 Tm (EVX-180)
14.2 Tm (EVX-184)

Thiele-Small Parameters:

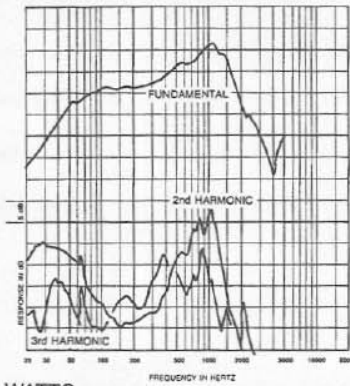
- f_s: 20 Hz
- R_e: 5.0 ohms (EVX-180)
2.7 ohms (EVX-184)
- Q_{ts}: 0.220
- Q_{ms}: 4.71
- Q_{es}: 0.231
- V_{bs}: 922 L (32.7 cu. ft.)
- S_d: 0.125 sq. m (194. sq. in.)
- X_{max}: 10.2 mm (0.40 in.)
- η_o: 3.08%
- P_e: 600 watts EIA RS-426A
500 watts continuous sine wave

Response in Standard Baffle

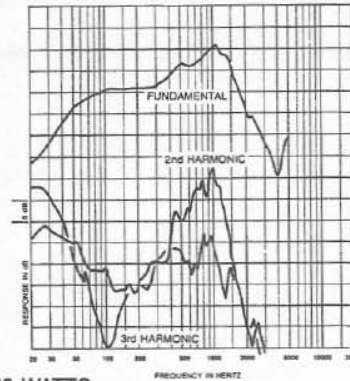


NOTE: AES requires a large, planar baffle for this test, WHICH IS INTENDED TO SHOW SMOOTHNESS AND OFF-AXIS RESPONSE, NOT BASS RESPONSE. This has proven to be inconvenient and prohibitive, due to its size. Here, we have chosen our lab standard low-diffraction 12-cubic-foot test enclosure, which will demonstrate the same characteristics as the "AES standard baffle."

Distortion Response

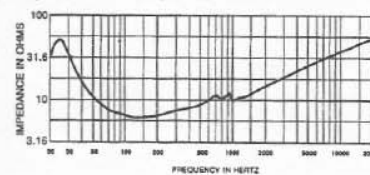


6 WATTS



60 WATTS

Impedance Response:



MULTIPLE DRIVER APPLICATION:

When used in arrays and multiple driver bass boxes, the system Thiele-Small parameters can be synthesized as follows. This data should be used for multiple-driver configurations.

Two (2) Drivers:

- f_s: 19.4 Hz
- Q_{ts}: 0.229
- V_{as}: 65.3 cu. ft. (1848 L)

Four (4) Drivers:

- f_s: 18.6 Hz
- Q_{ts}: 0.238
- V_{as}: 130.0 cu. ft. (3679 L)

Designers will find the following equation useful in tuning their enclosures:

$$L_v = \frac{S_v}{3.7 \times 10^{-4} V_B f_B^2} - K r$$

Where:

- L_v = Length of vent or thickness of baffle, for hole in baffle, in inches
- S_v = Area of vent in square inches
- V_B = Volume of box in cubic feet
- f_B = Box tuning in Hz
- r = Radius of vent in inches
- K = 1.7 for a hole in baffle 1.5 for a tube

WARRANTY (Limited)

Electro-Voice Speakers and Speaker Systems (excluding active electronics) are guaranteed for five years from date of original purchase against malfunction due to defects in workmanship and materials. If such malfunction occurs, unit will be repaired or replaced (at our option) without charge for materials or labor if delivered prepaid to the proper Electro-Voice service facility. Unit will be returned prepaid. Warranty does not extend to finish, appearance items, burned coils, or malfunction due to abuse or operation under other than specified conditions, including cone and/or coil damage resulting from improperly designed enclosures, nor does it extend to incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you. Repair by other than Electro-Voice or its authorized service agencies will void this guarantee.

A list of authorized warranty service agencies is available from Electro-Voice, Inc., 600 Cecil Street, Buchanan, MI 49107 (AC/616-695-6831); Electro-Voice, Inc., 3810 148th Avenue N.E., Redmond, WA 98052 (AC/206-881-9555); and/or Electro-Voice West, 8234 Doe Avenue, Visalia, CA 93291 (AC/209-651-7777). This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Service and repair address for this product: Electro-Voice, Inc., 600 Cecil Street, Buchanan, Michigan 49107.

Specifications subject to change without notice.

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