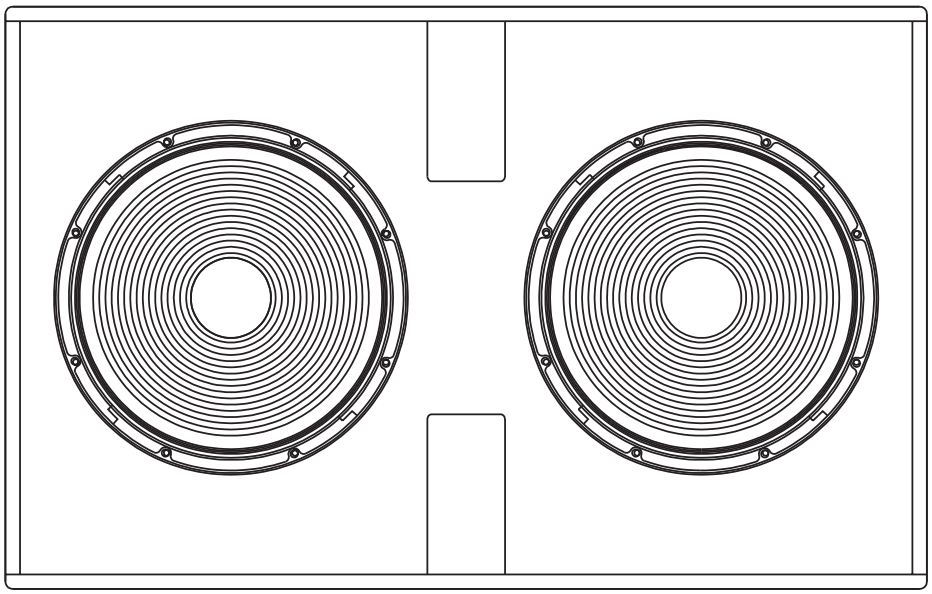
Electro-Voice®

TL880D

Very-Low-Frequency Speaker System



- **Designed for cinema subwoofer use**
- **High acoustic output to below 20 Hz**
- **Two EVX-180A woofers provide very high peak and long-term output that complements the dynamic potential of digital sound on film**
- **2,000 watts continuous program**
- **Side-mounted connection panel facilitates hookup when depth behind the screen is restricted**
- **High output ability in the 20- to 40-Hz range is also ideal for very-low-frequency synthesized effects, down-tuned bass guitars or pipe organ**
- **Approved for subwoofer use in THX® cinema systems***

Description and Applications

The Electro-Voice TL880D is a member of the TL series of low-frequency enclosures. The TL880D is a dual direct-radiating vented design that provides high efficiency, low distortion and excellent low-frequency performance. The TL880D employs two long-throw EVX-180A 18-inch loudspeakers, in an 15.5-ft^3, black-finished enclosure without grille. It is specifically designed to meet the low-frequency demands of digital cinema sound, in subwoofer applications. The TL880D's high pumping capability, high acoustic output ability and extended bass response (to below 20 Hz) make it particularly appropriate for the dynamic potential of the digital cinema application. (The TL880D is approved for subwoofer use in THX® cinema systems.)* The side-mounted input panel facilitates behind-the-screen installation, where limited space between the screen and theatre wall often makes it difficult to connect to the back of an enclosure.

The TL880D's performance characteristics also make it highly appropriate as the subwoofer in large, multiway systems for contemporary music playback and sound reinforcement. The TL880D has more output below 40 Hz than the devices typically used in these applications.

Frequency Response

The TL880D's axial frequency response was measured in Electro-Voice's large anechoic chamber at a distance of 10 feet with a swept sine-wave input of 4 volts. Figure 1 has been averaged and corrected for 1 watt/1 meter.

Directivity

The directional characteristics of the TL880D were measured in Electro-Voice's large anechoic chamber; the test signal was one-third-octave filtered pink noise at the frequencies indicated. A full spherical measurement system was used, which is compatible with the AcoustaCADD™ computer-aided design program. All directional information was measured at 20 feet.

Figure 2 illustrates the horizontal and vertical polar responses. Figure 3 shows the horizontal and vertical beamwidths. Beamwidth is the angle at which the horizontal and vertical polar responses have decreased in level by 6 dB when compared to the axial frequency response.

Figure 4 illustrates the total directivity of the TL880D. The directivity factor R_θ (Q) is the relative value, at a point, of the TL880D when compared to an ideal spherical response. The directivity index, D_i, is calculated by $D_i = 10 \log R_\theta$.

Power Hanndling Capacity

To our knowledge Electro-Voice was the first U.S. manufacturer to develop and publish a power test closely related to real-life conditions. A random noise input signal is used because it contains many frequencies simultaneously, just like real voice or instrument program. The signal contains more energy at extremely high and low frequencies than typical actual program, adding an extra margin of reliability. The test combines not only the overall long-term average or continuous level—which our ear interprets 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 excursion). Note that the sine-wave test signals sometimes used have a much less demanding peak value relative to their average level. In actual use, long-term average levels exist from several seconds on up. We test for several hours, adding another extra level of reliability.

*THX is a registered trademark of Lucasfilm Ltd.

Specifically, the TL880D is designed to withstand the power test described in ANSI/EIA RS-426-A 1980. The EIA test spectrum is applied for eight hours. The spectrum is obtained by filtering white noise (a particular type of random noise with equal energy per bandwidth). The filter applies a 6-dB-per-octave slope below 40 Hz and above 318 Hz. When measured with a one-third-octave constant-percentage analyzer, this filter produces a spectrum whose 3-dB-down points are at 100 Hz and 1,200 Hz with a 3-dB-per-octave slope above 1,200 Hz. This shaped signal is fed to the power amplifier with the continuous power set to provide 1,200 watts into the 4.8-ohm EIA equivalent impedance (75.9 volts rms).

Amplifier clipping sets instantaneous peaks at 6 dB above the continuous power, or 4,800 watts peak (151.8 volts peak). This procedure provides a rigorous test of both thermal and mechanical failure modes.

The TL880D has 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.

Subpassband Speaker Protection

Below the enclosure tuning frequency, cone excursion increases rapidly. Since acoustic output is also falling rapidly, there is no utility in driving the system with signals much below tuning frequency. While such signals may be in the program material, they are often extraneous, such as a dropped microphone. The Electro-Voice EX-24, XEQ-2 and XEQ-3 electronic crossover/equalizers can provide the necessary subpassband protection. The 3-dB-down points are 30 Hz (EX-24 and XEQ-2) and 16 Hz or 32 Hz (XEQ-3).

Other high-pass filters are available and one-third-octave equalizers can also be effective at providing the required protection.

Use In Multiples

Cone loudspeakers may be stacked for greater acoustic output and a narrower beamwidth. (It is assumed that all cones are operating in unison or "in phase.") This principle is already employed in the dual-woofer TL880D, and is responsible for the higher sensitivity and narrower vertical beamwidth (with the system long axis vertical) relative to similar single-woofer systems. In addition, two TL880D's can be used side-by-side and their combined performance will be different from that of a single TL880D in the ways outlined below.

At relatively low frequencies, below about 150 Hz for typical TL series dimensions, stacking produces additional acoustic output without altering dispersion. When a common signal is applied, a 6-dB increase in maximum acoustic output occurs. The cones "mutually couple" and act as one cone with twice the area (therefore twice the efficiency) and twice the power capacity. The additional cone area provides 3 dB more output and the additional power capacity accounts for the remaining 3 dB.

Specifically, mutual coupling occurs at frequencies whose wavelengths are longer than one-quarter the center-to-center distance between the cones. The highest frequency at which mutual coupling occurs is calculated from the following equation:

$$f @ \frac{3{,}000}{D_{MAX}},$$

where D_{MAX} (inches) is the distance between the cones, and f (Hz) is the highest frequency at which coupling occurs. When D_{MAX} is greater than one-quarter wavelength, which would occur if two TL880D's were widely spaced, or at frequencies much above f even when closely spaced, the increase in acoustic output is limited to the 3-dB power-handling increase.

Installation and Suspension of TL880D Enclosures

The TL880D is designed for typical cinema stage (behind-the-screen) applications where subwoofers are mounted on the stage floor. **The TL880D is not designed to be self-suspended from above, and if suspended, must be supported and hung in a way which does not depend on the structure of the TL880D itself for support.**

Architects' and Engineers' Specifications

The loudspeaker system shall be a dual low-frequency, bass-reflex design. Two 18-inch woofers shall be front mounted in an 15.5-ft^3 enclosure. The system shall meet the following criteria: power handling, 1,200 watts of pink noise with a 6-dB crest factor; frequency response, smooth and uniform, usable at high output levels from 23 to 2,000 Hz; sensitivity, 98 dB at one watt, one meter, 100 to 800 Hz, on axis; impedance (woofers paralleled), 4 ohms nominal, 4.2 ohms minimum; dispersion angles 220° (horizontal) x 180° (vertical) at 200 Hz. The enclosure shall be constructed of black texture-painted poplar plywood . The enclosure will contain sound-absorbing glass wool. Each woofer shall have the capacity to be fed independently of the other. The input panel and connectors shall be side-mounted. An installed vent cover shall be supplied that, when removed, shall raise the box tuning frequency from 25 Hz to 30 Hz, for increased output in the 30- to 40-Hz range. The enclosure dimensions shall be 47.5 in. high x 30.0 in. wide x 23.8 in. deep (121 cm x 76.2 cm x 60.5 cm). Net weight shall be 160 lb (72.6 kg). The low-frequency speaker system shall be the Electro-Voice TL880D.

Uniform Limited Warranty

Electro-Voice products are guaranteed against malfunction due to defects in materials or workmanship for a specified period, as noted in the individual product-line statement(s) below, or in the individual product data sheet or owner's manual, beginning with the date of original purchase. If such malfunction occurs during the specified period, the product will be repaired or replaced (at our option) without charge. The product will be returned to the customer prepaid. **Exclusions and Limitations:** The Limited Warranty does not apply to: (a) exterior finish or appearance; (b) certain specific items described in the individual product-line statement(s) below, or in the individual product data sheet or owner's manual; (c) malfunction resulting from use or operation of the product other than as specified in the

product data sheet or owner's manual; (d) malfunction resulting from misuse or abuse of the product; or (e) malfunction occurring at any time after repairs have been made to the product by anyone other than EVI Audio Service or any of its authorized service representatives. **Obtaining Warranty Service:** To obtain warranty service, a customer must deliver the product, prepaid, to EVI Audio Service or any of its authorized service representatives together with proof of purchase of the product in the form of a bill of sale or receipted invoice. A list of authorized service representatives is available from EVI Audio Service at 600 Cecil Street, Buchanan, MI 49107 (800/234/6831 or FAX 616/695/4743)**. Incidental and Consequential Damages Excluded:** Product repair or replacement and return to the customer are the only remedies provided to the customer. Electro-Voice shall not be liable for any incidental or consequential damages including, without limitation, injury to persons or property or loss of use. Some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitation or exclusion may not apply to you. **Other Rights:** This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Electro-Voice Speakers and Speaker Systems are guaranteed against malfunction due to defects in materials or workmanship for a period of five (5) years from the date of original purchase. The Limited Warranty does not apply to burned voice coils or malfunctions such as cone and/or coil damage resulting from improperly designed enclosures. Electro-Voice active electronics associated with the speaker systems are guaranteed for three (3) years from the date of original purchase. Additional details are included in the Uniform Limited Warranty statement.

Electro-Voice Electronics are guaranteed against malfunction due to defects in materials or workmanship for a period of three (3) years from the date of original purchase. Additional details are included in the Uniform Limited Warranty statement.

For warranty repair, service information, or a listing of the repair facilities nearest you, contact the service repair department at: 616/695-6831 or 800/685-2606.

For technical assistance, contact Technical Support at 800/234-6831 or 616/695-6831, M-F, 8:00 a.m. to 5:00 p.m. Eastern Standard time.

Specifications subject to change without notice.

Figure 1—TL880D Axial Frequency Response (anechoic environment, 1 watt/1 meter)

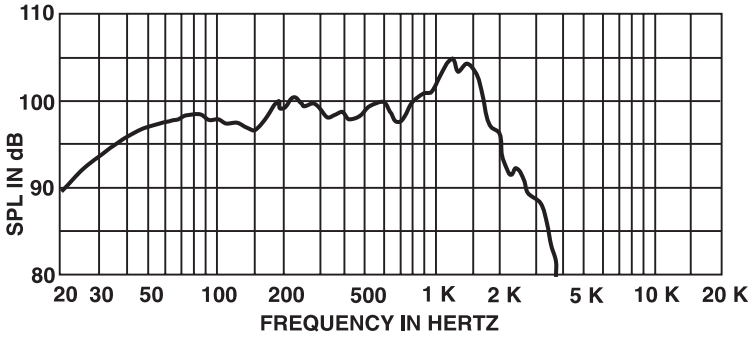


Figure 2—TL880D One-Third-Octave Polar Responses (anechoic environment)

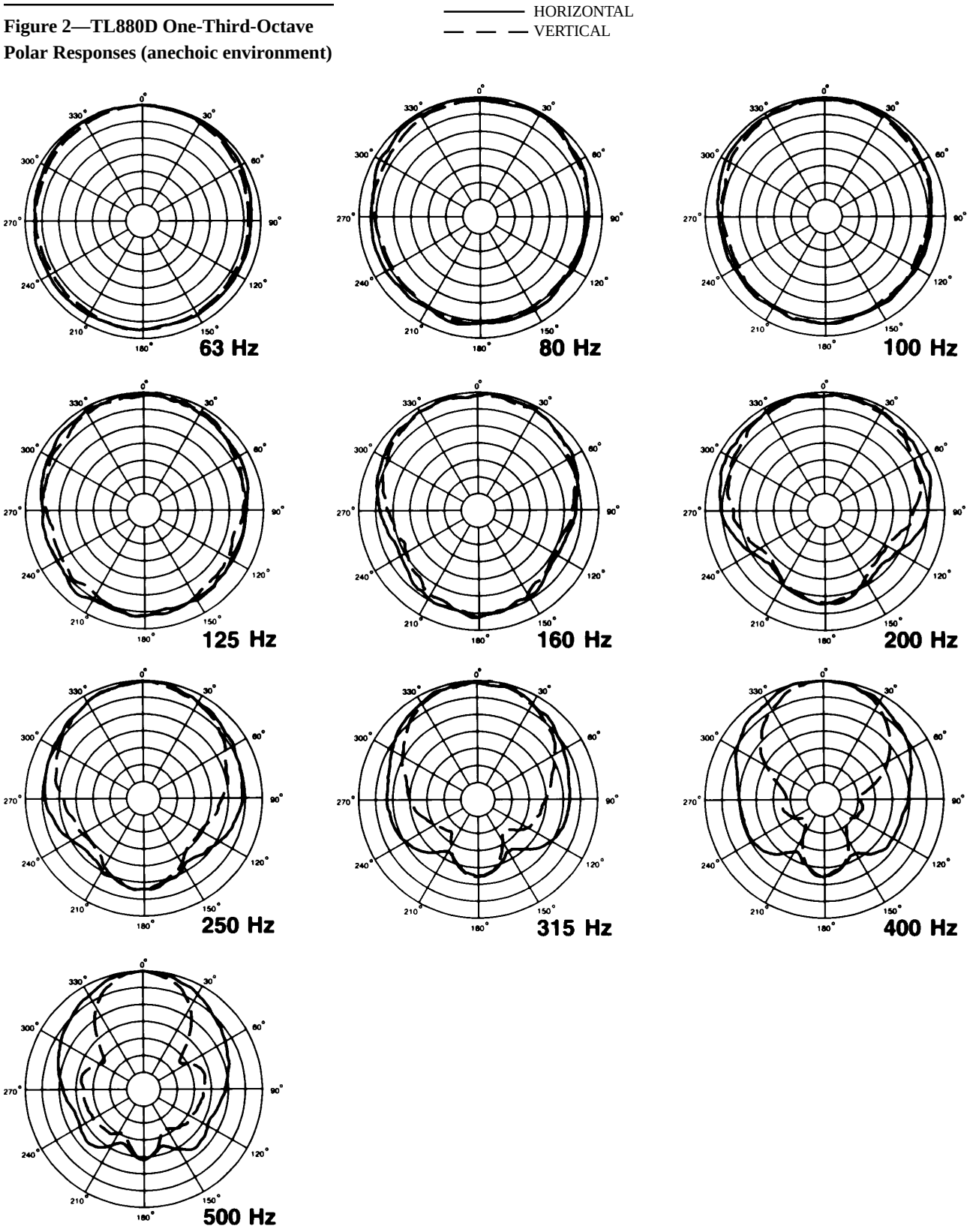


FIGURE 3—TL880D One-Third-Octave Beamwidth vs Frequency (anechoic environment)

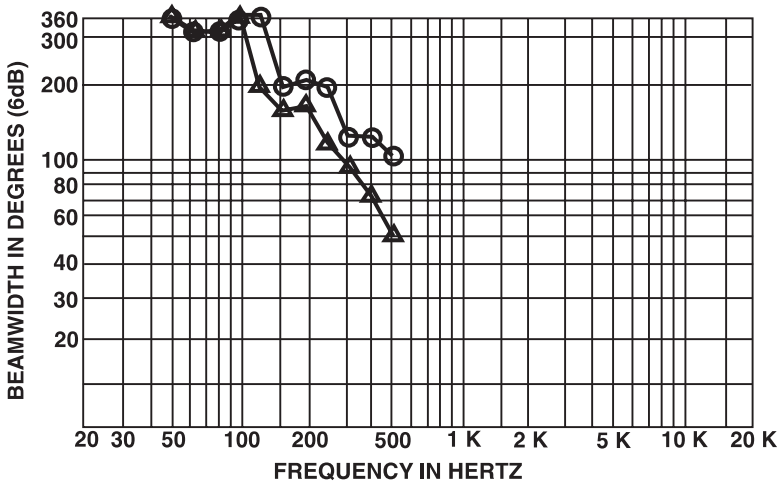


FIGURE 4—TL880D One-Third-Octave Directivity vs Frequency (anechoic environment)

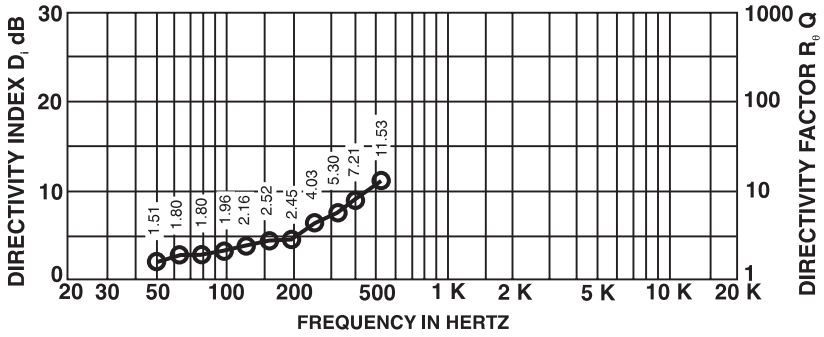
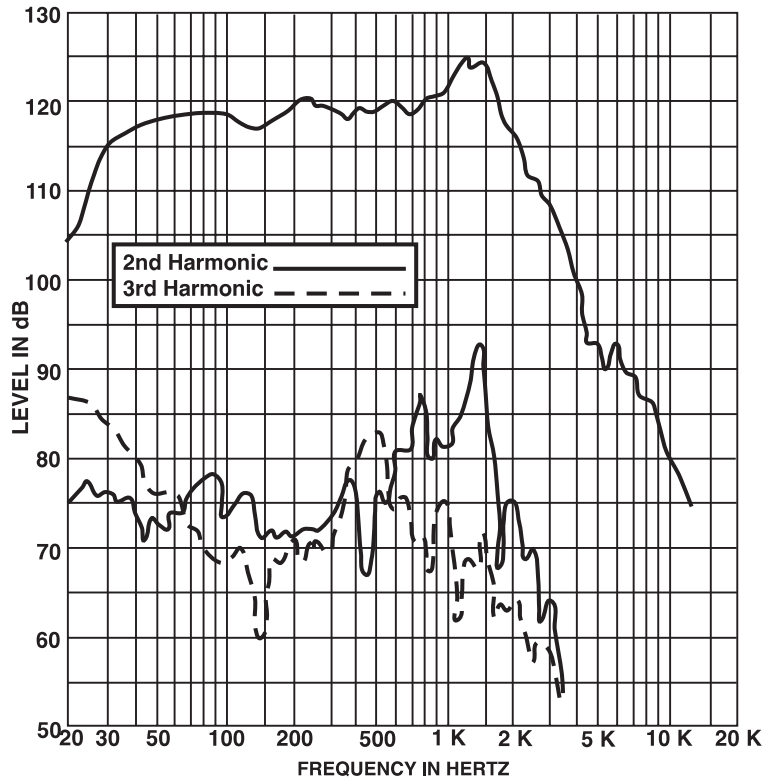


FIGURE 5—TL880D Harmonic Distortion, 0.1 Rated Power Input (120 watts), 10 Feet on Axis



TL880D Very-Low-Frequency Speaker System

Specification

Frequency Response, 1 Watt at 1 Meter on Axis, Swept One-Third-Octave Pink Noise, Anechoic Environment (see Figure 1):
23-1,800 Hz

Low-Frequency 3-dB-Down Point:
23 Hz

Usable Low-Frequency Limit (10-dB-down point),

Normal Tuning:
20 Hz

Half-Space Reference Efficiency:
6.0%

Power-Handling Capacity (see Power Handling section),

Long-Term Average per ANSI/EIA RS-426-A 1980:
1,200 watts

Continuous Program:
2,000 watts

Maximum Long-Term Average Mid-Band Acoustic Output:
72 watts

Sound Pressure Level at 1 Meter, 1 Watt (2.0 volts) Input, Anechoic Environment, Band-Limited Pink-Noise Signal,

100-800 Hz:
98 dB

50-125 Hz:
96 dB

Dispersion Angle Included by 6-dB-Down Points on Polar Responses, Indicated One-Third-Octave Bands of Pink Noise (see Figure 3),

90-125 Hz, Horizontal and Vertical:
360°

125-500 Hz, Horizontal:
200° ± 80°

125-500 Hz, Vertical:
160° ± 80°

Directivity Factor R_θ (Q), Median over Indicated Range (see Figure 4),

50-125 Hz:
1.0

125-500 Hz:
5.2

Directivity Index D_i (10 log R_θ),

50-125 Hz:
0.0 dB

125-500 Hz:
7.2 dB

Distortion, 0.1 Full Power Input (see Figure 5),

Second Harmonic,

100 Hz:
0.9%

1,000 Hz:
0.9%

Third Harmonic,

100 Hz:
0.4%

1,000 Hz:
0.3%

Transducer Complement:
Two EVX-180A

Net Box Volume:
439 liters (15.5 ft^3)

Box Tuning Frequency:
25 Hz

Step-Down Peak-Boost Frequency:
25 Hz

Impedance, Nominal/Minimum:
4.0/4.2 ohms

Input Connectors:
Side-mounted screw terminals (#10) on barrier strip

Enclosure Materials and Finish:
Black texture-painted poplar plywood

Dimensions,

Height:
1210 mm (47.5 in.)

Width:
762 mm (30.0 in.)

Depth:
605 mm (23.8 in.)

Net Weight:
72.6 kg (160 lb)

Shipping Weight:
80.0 kg (176 lb)

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