



Electro-Voice®

a MARK IV company

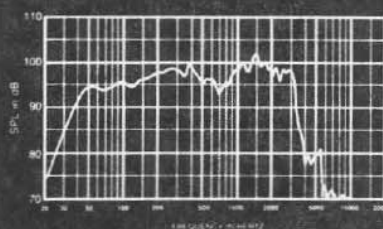


FIGURE 1
Axial Frequency Response (1 watt/1 meter)

TL18-1

Very Low-Frequency
Speaker System

SPECIFICATIONS:

Frequency Response, 1 watt @ 1m on Axis, Swept One-Third-Octave Pink Noise, Half-Space Anechoic Environment (see Figure 1):
40-3200 Hz

Low-Frequency 3-dB-Down Point, Normal:
40 Hz

Step-Down (with equalization):
28 Hz

Usable Low-Frequency Limit (10-dB-down point), Normal:
30 Hz

Step-Down (with equalization):
25 Hz

Half-Space Reference Efficiency:
2.9%

Long-Term Average Power Handling Capacity per EIA Standard RS-426A (see Power Handling Capacity section):
400 watts

Maximum Long-Term Average Midband Acoustic Output:
11.6 watts

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

100-800 Hz:
97 dB

50-125 Hz:
95 dB

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

50-125 Hz Horizontal and Vertical (see Figure 3):
360°

400-800 Hz Horizontal (see Figure 3):
110° ± 20°

400-800 Hz Vertical (see Figure 3):

110° ± 10°

Directivity Factor $R_s(Q)$, Median over Indicated Range,

50-125 Hz (see Figure 4):
1.0

400-800 Hz (see Figure 4):
5.1

Directivity Index D_s , Median over Indicated Range,

38-125 Hz (see Figure 4):
0.0 dB

400-800 Hz (see Figure 4):
7.1 dB

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

Second Harmonic,
100 Hz:
2.0%

1000 Hz:
2.0%

Third Harmonic,
100 Hz:
0.9%

1000 Hz:
1.1%

Distortion, 0.01 Full Power Input (see Figure 6)

Second Harmonic,
100 Hz:
0.7%

1000 Hz:
0.8%

Third Harmonic,
100 Hz:
0.5%

1000 Hz:
0.8%

Transducer Complement:
(1) DL18MT-WP

Box Tuning Frequency,
Normal:
40 Hz

Step-Down:
28 Hz

Impedance,

Nominal:
8 ohms

Minimum:
7 ohms

Input Connections:

Screw Terminals (#10) on barrier strip

Enclosure Materials and Finish:

0.7 in (1.8cm) Black Pro-Wood, composite refinishing structural material.

Suspension:
HS-3 and HS-1 accessory kits available for hanging

Grille: Black Vibration Resistant Steel.

Patent: The following patents apply:
4,547,632 4,624,338

Dimensions,

Height:
34-in (86.3cm))

Width:
24-in (61.0cm)

Depth:
20.5-in (52.1cm)

Net Weight:
41.0 kg (90 lb)

Shipping Weight:
47.0 kg (104 lb)

DESCRIPTION

The Electro-Voice TL18-1 is a member of the new TL series II family of low-frequency enclosures. The TL18-1 is a dual direct radiating vented design and provides high-efficiency, low distortion and excellent very low-frequency performance in a compact enclosure. The TL18-1 employs a single long throw 18-inch loudspeakers, in a 7.4 ft enclosure. The Pro-wood™ enclosure is finished in black with a matching metal grille. Connections are made via barrier strip (#10) recessed into the back of the enclosure on a durable molded connector panel. The enclosure is constructed from Pro-wood™, a composite structural material which is easily re-finished (see Finishing Pro-wood™).

Pro-wood™ is made of selectively orientated hardwood strands strongly bonded together within a phenolic resin matrix. The surface is a proprietary vinyl laminate especially formulated for Electro-Voice which can be painted, or stained, to match any decorative environment (see Finishing Pro-wood™).

The TL series II family of low-frequency enclosures are ideally suited for any installation where high-quality sound is required. The weather resistant finish makes these systems suitable for both indoor and outdoor applications including stadiums, auditoriums and churches.

The enclosures may be stacked for greater output capability or for a narrower vertical beamwidth. Every time the number is doubled, approximately 6dB in output is gained (3dB for double power handling and 3dB for the resultant higher Q). See "USE IN MULTIPLES"

FREQUENCY RESPONSE

TL18-1 frequency response was measured in an anechoic environment at 1 watt @ 1m on axis with swept one-third octave pink noise. (See Figure 1.)

DIRECTIVITY

TL18-1 directional characteristics were measured by running a set of polar-response curves in EV's large anechoic chamber. The test signal was one-third octave pseudo-random pink noise centered at the frequencies indicated in Figures 3 and 4. The curves show horizontal (side-to-side) dispersion when the enclosure's long axis is vertical. The vertical (up-and-down) polar responses are also shown.

Additional typical information is provided in Figure 3 which shows 6-dB-down beamwidth versus frequency. Figure 4 shows the directivity factor and directivity index versus frequency.

DISTORTION

Following AES (Audio Engineering Society) recommended practice, plots of second- and third-order harmonic distortion for 0.1 rated input power are shown in Figure 5. Figure 6 shows distortion at 0.01 rated input power.

POWER HANDLING 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. 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). 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, but we apply the long-term average to several hours, adding another extra measure of reliability.

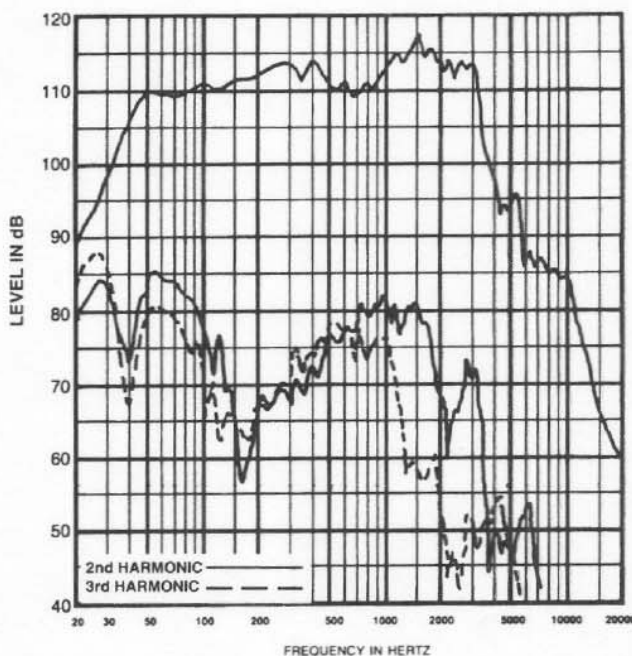


FIGURE 5

TL18-1 Harmonic Distortion, 0.1 Rated Power Input (40 Watts), 10 Feet on Axis

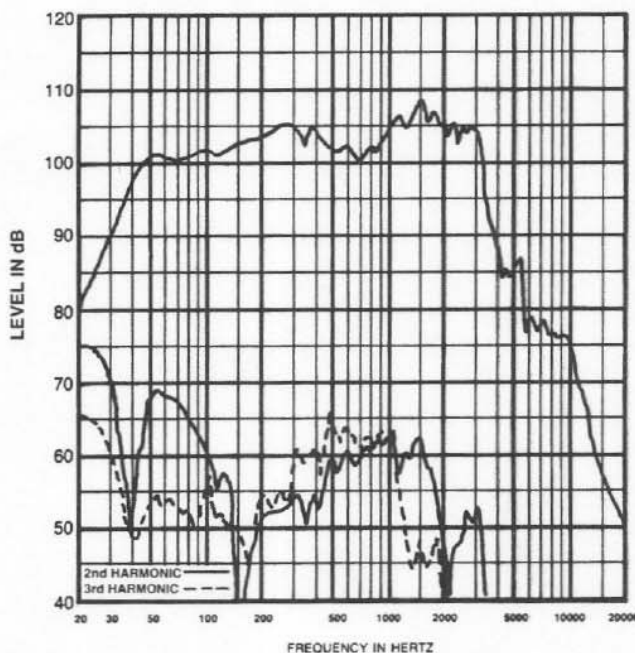


FIGURE 6

TL18-1 Harmonic Distortion, 0.01 Rated Power Input (4 Watts), 10 Feet on Axis

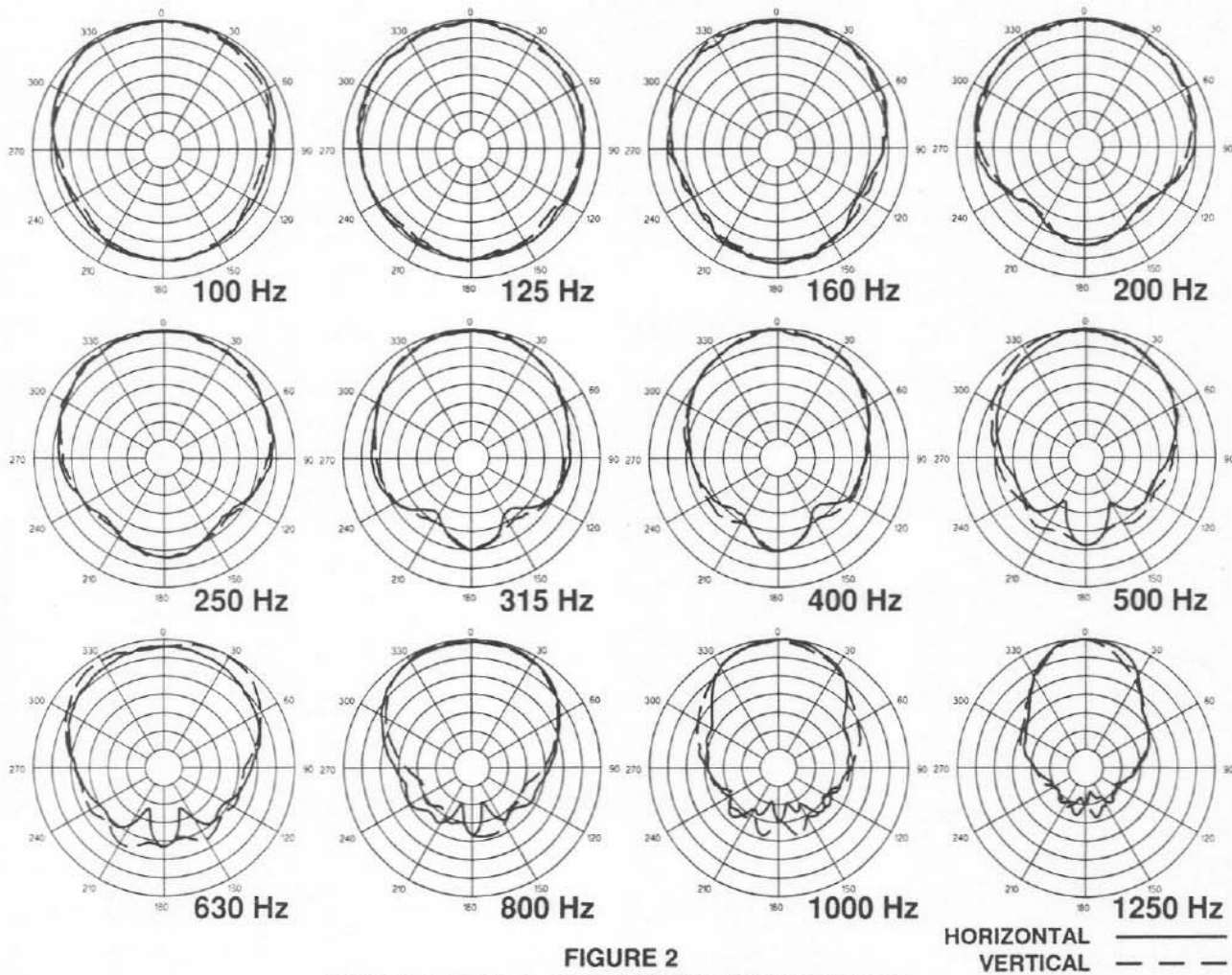


FIGURE 2
TL18-1 Polar Response (Octave, 4 Volts/10 Feet)

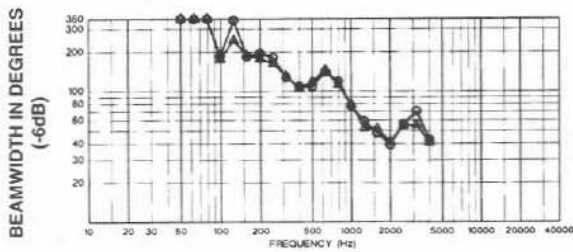


FIGURE 3
TL18-1 Beamwidth vs Frequency
Whole Space (Anechoic)

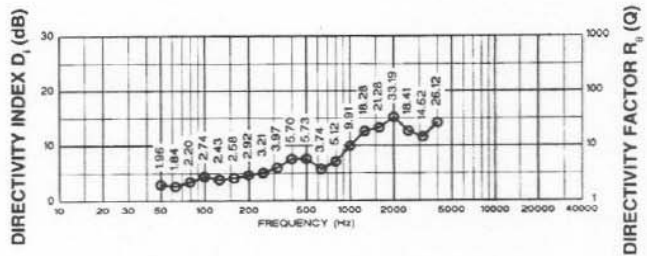


FIGURE 4
TL18-1 Directivity vs Frequency
Whole Space (Anechoic)

Specifically, the TL18-1 is 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 analyzer (one-third-octave), this shaping 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 sent to the power amplifier with the continuous power set at 400 watts into the 5.8 ohms EIA equivalent impedance for the TL18-1 (48.2 volts true RMS).

Amplifier clipping sets instantaneous peaks at 6 dB above the continuous power, or 1,600 watts peak (96.4 volts peak). This procedure provides a rigorous test of both thermal and mechanical failure modes.

STEP DOWN

Step down is a method of extending the low frequency response by increasing the power input to the system instead of the enclosure volume. In step down, the enclosure is tuned at a lower than normal frequency. This increases the output at the new tuning frequency and reduces the output at the original tuning frequency. The resulting smoothly falling amplitude response can be easily equalized to obtain a new 3 dB down point in the region of 0.7 that of the original frequency. To obtain a similar response without step down would require an enclosure with at least twice the volume.

Step down mode can be instigated by using the supplied port cover. First remove the metal grille by removing the screws. Install the plastic port cover and staple it in place. Replace the metal grille. This lowers the box tuning from 40 to 28 Hz. When an appropriate low-frequency boost and cut equalization is applied, such as that provided by the Electro-Voice XEQ2 or XEQ3 active crossover. The normal system f3 of 50 Hz is reduced to 36 Hz. The suggested equalization section is an underdamped, second order high-pass filter tuned to 30 Hz with a Q of 2. This provides a boost of 6 db at the tuning frequency and a 12 dB-per-octave rolloff below.

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 the tuning frequency. While such signals may be in the program material, they are often extraneous such as from record-surface irregularities (strong 5-25-Hz components) or a dropped microphone. The step-down equalization previously described provides protection automatically. The Electro-Voice XEQ-2 active crossover/ equalizer also provides protection in its "flat" low-frequency switch position; response is 3 dB down at 30 Hz and falls at 12 dB per octave below that frequency. Other high-pass filters are commercially available. Such protection is also provided by some-octave equalizers.

USE IN MULTIPLES

TL18-1's may be used in multiples to increase acoustic output. In the following discussion, it is assumed that all speaker cones are operating in unison (in phase) when a common signal is applied. A 6-dB increase in maximum acoustic output results when two speakers are located side by side. For operation at very low frequencies, the woofer cones "mutually couple," acting as one speaker with cone area and power-handling capacity twice that of a single speaker. The doubling of cone area doubles efficiency, providing a 3-dB increase in sound pressure level. The second 3-dB comes from the doubling of power capacity.

Mutual coupling occurs when the frequency is such that the center-to-center distance between the two speaker cones is less than about one-quarter wavelength. For a given center-to-center distance, the highest frequency at which mutual coupling will occur can be calculated from the following formula:

$$f \approx \frac{3,000}{D_{\max}}$$

where D_{\max} is the distance in inches and f is frequency in Hz. When D_{\max} is greater than one-quarter wavelength, as would occur if two TL18-1's were widely spaced, the level increase tends to be limited to the 3-dB power-handling increase.

HANGING TL SERIES II ENCLOSURES

The TL series II family of products has been developed and is fully integrated with the HS family of hanging hardware. Each HS kit consists of a steel tube, two brackets, two eyebolts and fasteners. The Electro-Voice contractor installs the HS kit by drilling two holes into the enclosure in predetermined positions and assembling the HS kit. Full instructions are included with each HS kit and a template is packed with the TL18-1 to show the location of the holes. A single TL18-1 requires a single HS-3 to suspend it horizontally, or a single HS-1 to suspend it vertically. While each TL18-1 requires two HS-1 (horizontal), or two HS-3's (vertical), if multiple cabinets are suspended (up to a maximum of 3). Full attention should be given to the instructions limitations in the HS instruction sheet.

FINISHING PRO-WOOD™

Finishing Pro-wood™ is simple and straight forward as long as a few things are understood:

1. Pro-wood™ has been tested with a large number of commercially available paints with 100% success. However it is impossible to test every paint available. Electro-Voice therefore recommends that you test a small area on the rear of the cabinet or under the grille to check there are no adverse effects.
2. Ensure the surface is clean and free of grease (use soapy water if necessary).
3. Any latex, enamel or acrylic based paint can be used but the high tech top layer of Pro-wood™ was developed in conjunction with Pittsburgh Paints. They developed their Manor Hall® Exterior House series of paints to compliment the Pro-wood™.

Electro-Voice recommends the use of these paints in adverse or tough situations.

4. Water based Latex paints in particular can take a considerable time to dry fully. They can be handled in a few hours but full strength may not be achieved for a week. Particularly in damp or cool conditions.
5. The paint can be applied with a brush, roller or spray. Care should be taken not to get paint on the woofer cone.
6. Stain can be used to highlight the grain in the Pro-wood™ or match real wood. But first the black surface must be lightened by painting with a light color such as white. Care should be taken when using stain because it is impossible to re-finish the material after staining. A good approach is to use a stained varnish but be careful as it is very difficult to lighten a stain.

USE OUTDOORS

If the TL18-1 is used outdoors the following procedures should be followed. Direct rain and sunlight should be avoided. The enclosures should be painted with a high quality exterior grade paint, following the instructions in the Finishing Pro-wood™ section. The enclosures hold not, in any circumstances be allowed to stand in water.

WARRANTY (Limited)

Electro-Voice Professional Sound Reinforcement Loudspeakers are guaranteed for five years from date of original purchase against malfunction due to defect in workmanship and materials. If the Loudspeakers are used outdoors the warranty is for one year from the date of original purchase. The instructions covering use outdoors must be followed. 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.



ELECTRO-VOICE, INC., 600 Cecil Street, Buchanan, Michigan 49107

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