

# Electro-Voice®

a MARK IV company

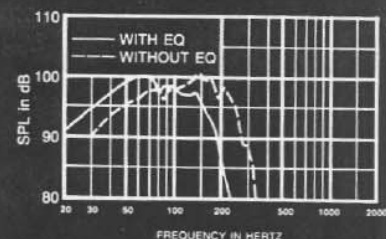


FIGURE 1  
Axial Frequency Response  
1 Watt/1 Meter

## Model MTL-2 Manifold Technology® Low-Frequency Sound Reinforcement System

### SPECIFICATIONS

Frequency Response, One Meter on Axis,  
Swept One-Third-Octave Pink Noise,  
Anechoic Environment (see Figure 1):  
40-200 Hz

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

Usable Low-Frequency Limit  
(10-dB-down point):  
37 Hz

Half-Space Reference Efficiency:  
5%

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

Short-Term Power Handling Capacity  
(10 milliseconds):  
3,200 watts

Maximum Long-Term Average  
Midband Acoustic Output:  
40 watts

Sound Pressure Level at 1 Meter,  
Indicated Input Power, Anechoic Environ-  
ment, Band-Limited Pink-Noise Signal,  
50-200 Hz,  
1 Watt: 98  
800 Watts: 131  
3,200 Watts: 137

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

63-100 Hz Horizontal:  
285° (+75°, -52°)

63-100 Hz Vertical:  
240° (+120°, -77°)

Directivity Factor  $R_0$  (Q), 63-100 Hz Median  
(see Figure 4):

1.84 dB (+0.36 dB, -0.37 dB)

Directivity Index  $D_i$ , 63-100 Hz Median  
(see Figure 4):

2.66 dB (+0.77 dB, -0.99 dB)

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

Second Harmonic,

50 Hz:

0.6%

100 Hz:

0.5%

Third Harmonic,

50 Hz:

0.6%

100 Hz:

0.2%

Distortion, Full Power Input  
(see Figure 6),

Second Harmonic,

50 Hz:

1.4%

100 Hz:

1.8%

Third Harmonic,

50 Hz:

2.0%

100 Hz:

0.8%

Transducer Complement:

Two DL18MT

Box Tuning Frequency:

37 Hz

Impedance,

Nominal:

Two 8-ohm loads

Minimum:

Two 8-ohm loads

Input Connections:

Neutrik Speakon™ NL4MPR

Enclosure Materials:

14-ply birch plywood

Finish:

Black Ozite Super TNT carpet

Hanging:

Two-point flying system  
(tracks accept Aeroquip 32102 fittings)

Dimensions,

Height:

91.4 cm (36.0 in.)

Width:

57.2 cm (22.50 in.)

Depth:

76.2 cm (30.0 in.)

Net Weight:

75.5 kg (166 lb)

Shipping Weight:

80.5 kg (177 lb)

### DESCRIPTION

The Electro-Voice MTL-2 Manifold Technology® low-frequency loudspeaker system is designed to compliment the MTH-2 mid/high frequency loudspeaker system. They combine to produce a high-output compact concert sound reinforcement system ideally suited for both the touring and the fixed installation markets. The MTL-2 is a vented box design incorporating two DL18MT woofers facing into a central manifold chamber. Manifold Technology, pioneered in the MTL-4, is an Electro-Voice patented method (U.S. patent no. 4,733,749) of combining the output of two, or more drivers, and increasing their acoustic load. Compared to conventional direct radiating designs, manifolding allows increased low-frequency efficiency and reduced distortion

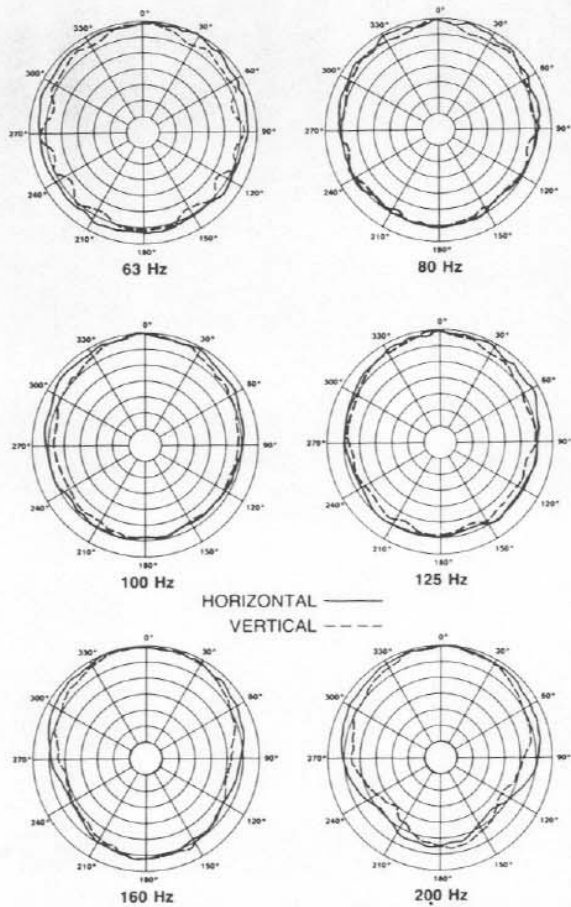


FIGURE 2 — MTL-2 Polar Response  
( $\frac{1}{3}$ -octave pink noise, 4 volts at 20 feet)

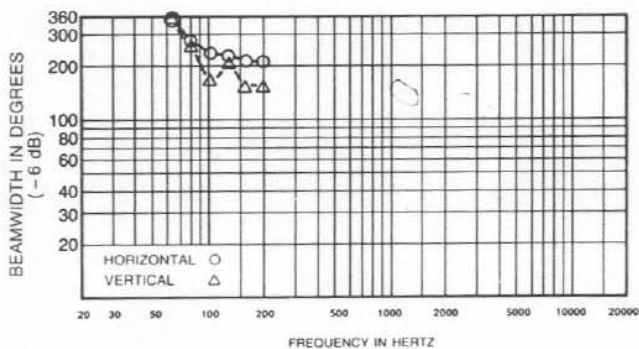


FIGURE 3 — MTL-2 Beamwidth vs. Frequency  
Whole Space (anechoic)

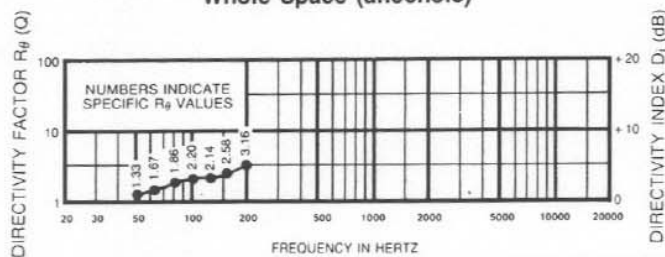


FIGURE 4 — MTL-2 Directivity Factor  $R_{\theta}$  (Q)  
and Directivity Index  $D_i$  vs.  
Frequency Whole Space (anechoic)

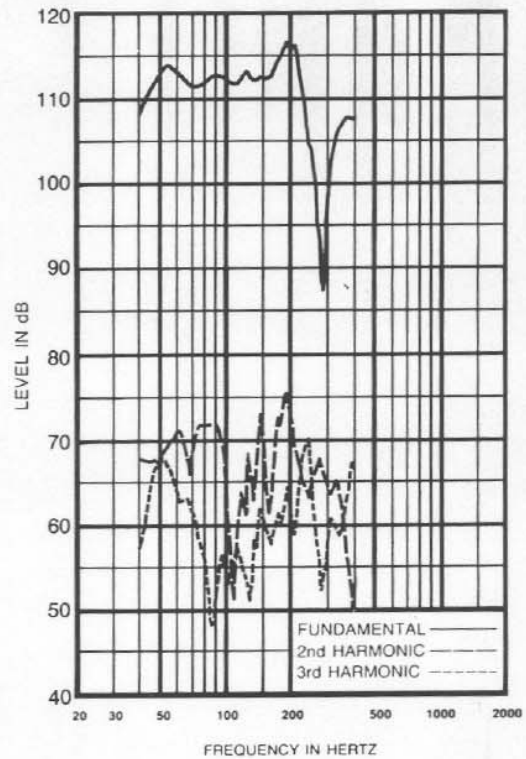


FIGURE 5 — MTL-2 Harmonic Distortion,  
0.1 Rated Power Input  
(80 watts), 10 Feet on Axis

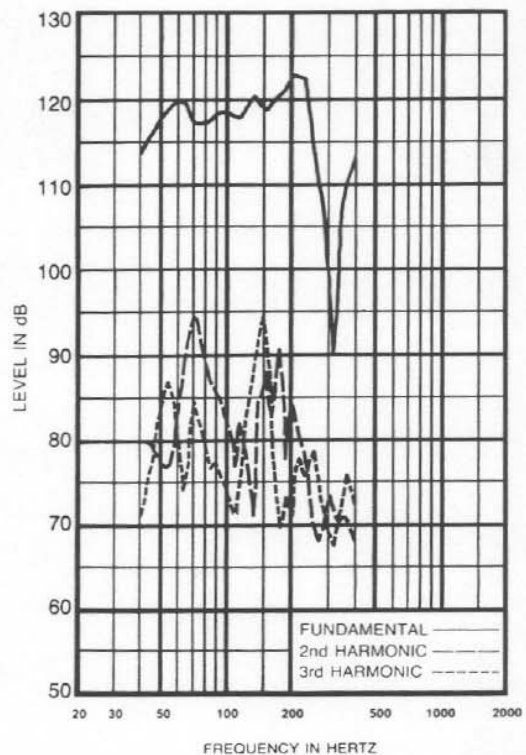


FIGURE 6 — MTL-2 Harmonic Distortion,  
1.0 Rated Power Input  
(800 watts), 10 Feet on Axis

in a singularly compact box. Typically, the MTL-2 is 2-3 dB more efficient in the crucial 40-80 Hz region than a comparable horn. Manifolding, in this configuration, has the added benefit of exposing the magnet assemblies to help minimize thermal build-up.

The DML-18MT 18-inch woofer was designed specifically for manifolding to achieve optimal performance in the MTL-2 enclosure. Its design assures linear, low-distortion output. The high-power, high-excursion drive of the DL18MT is augmented by two exclusive Electro-Voice features, the Thermo Inductive Ring, TIR™, and PROTEF™ coating. The TIR acts as a control on drive inductance and, more importantly, provides a major heat-transfer path from the top of the drive coil, reducing thermal dynamic-range compression. PROTEF is a Teflon®-based coating applied to the inside diameter of the top plate to physically protect the voice coil from rubbing during violent power peaks.

The MTL-2 is designed to survive the rigors of the road. 14-ply birch plywood is used throughout. Electro-Voice's unique two-point fying is installed as standard. The Aeroquip style tracks are recessed below the surface to prevent damage and mechanical interference (see Hanging section). The cabinet is covered in black Ozite Super TNT carpet, the most rugged available. A black, nylon, cloth, grille is supplied as standard.

#### APPLICATIONS

The MTL-2 is designed with the professional end user in mind. Whether used in regional touring or fixed installations the MTL-2 delivers high level, low distortion, low frequency performance. The small bulk, volume and frontal area of the MTL-2 belies the performance obtainable with Manifold Technology and allows the construction of compact, tight arrays.

The dimensions of the MTL-2 were selected to allow efficient truck packing. All fittings and fixtures are recessed to allow easy packing and unobtrusive installations.

It is possible to use the MTL-2 to augment the bass of any system but it has been optimized to compliment the MTH-2 high-frequency cabinet. Combining the MTL-2 with the MTH-2, the XEQ-3 electronic crossover and the EQMT2 EQ modules produces a fully integrated full-range sound system. Both cabinets are dimensionally identical and have similar hardware. A service data sheet is available for this product.

#### FREQUENCY RESPONSE

The MTL-2's optimum performance can be achieved using the dedicated low EQ module in the XEQ-3 electronic crossover. Figure 1 shows such a response. The measurements were made in an anechoic environment at one meter on axis with a one-watt power input. The response without EQ can be seen in Figure 1.

#### DIRECTIVITY

Figure 2 illustrates the directional characteristics of the MTL-2. The measurements were taken in EV's large anechoic chamber at a distance of 20 feet using pink noise at selected one-third-octave bands. Beamwidth is illustrated in Figure 3 and Directivity Factor  $R_0$  (Q) and Directivity Index  $D_i$ , in Figure 4. The figures demonstrate that the MTL-2 is more directional than most low-frequency systems. AcoustiCADD™ data is available for the MTL-2.

#### DISTORTION

Inherent in the Manifold Technology design are greatly reduced distortion components, when compared to conventional vented enclosures. Figure 5 and Figure 6 illustrate the second and third harmonic distortion components of the MTL-2 at 10% and 100% rated power. The XEQ-3 electronic crossover and dedicated EQ module were in operation when the measurements were taken.

#### 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 peaks exist from several seconds on up, but we apply the long-term average for several hours, adding another extra measure of reliability.

Specifically, the MTL-2 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 or 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 amplifiers with continuous power set at 400 watts into each of the 6.9-ohm EIA-

equivalent-impedance inputs (52.5 volts true rms), resulting in a total of 800 watts of continuous power being delivered to the MTL-2.

Amplifier clipping sets instantaneous peaks at 6 dB above the continuous power, or 3,200 watts peak (105 volts peak per input). This procedure provides a rigorous test of both thermal and mechanical failure modes.

#### SIGNAL PROCESSING

The MTL-2 has been designed to be used with the MTH-2. A dedicated set of modules have been designed for the XEQ-3 to maximize their performance. It is recommended that the modules be used. The "low EQ" module not only provides response correction but subpassband protection as well. Full details are available with the dedicated EQ modules, called EQMT2 and on the data sheet of the MTH-2.

#### SUBPASSBAND SPEAKER PROTECTION

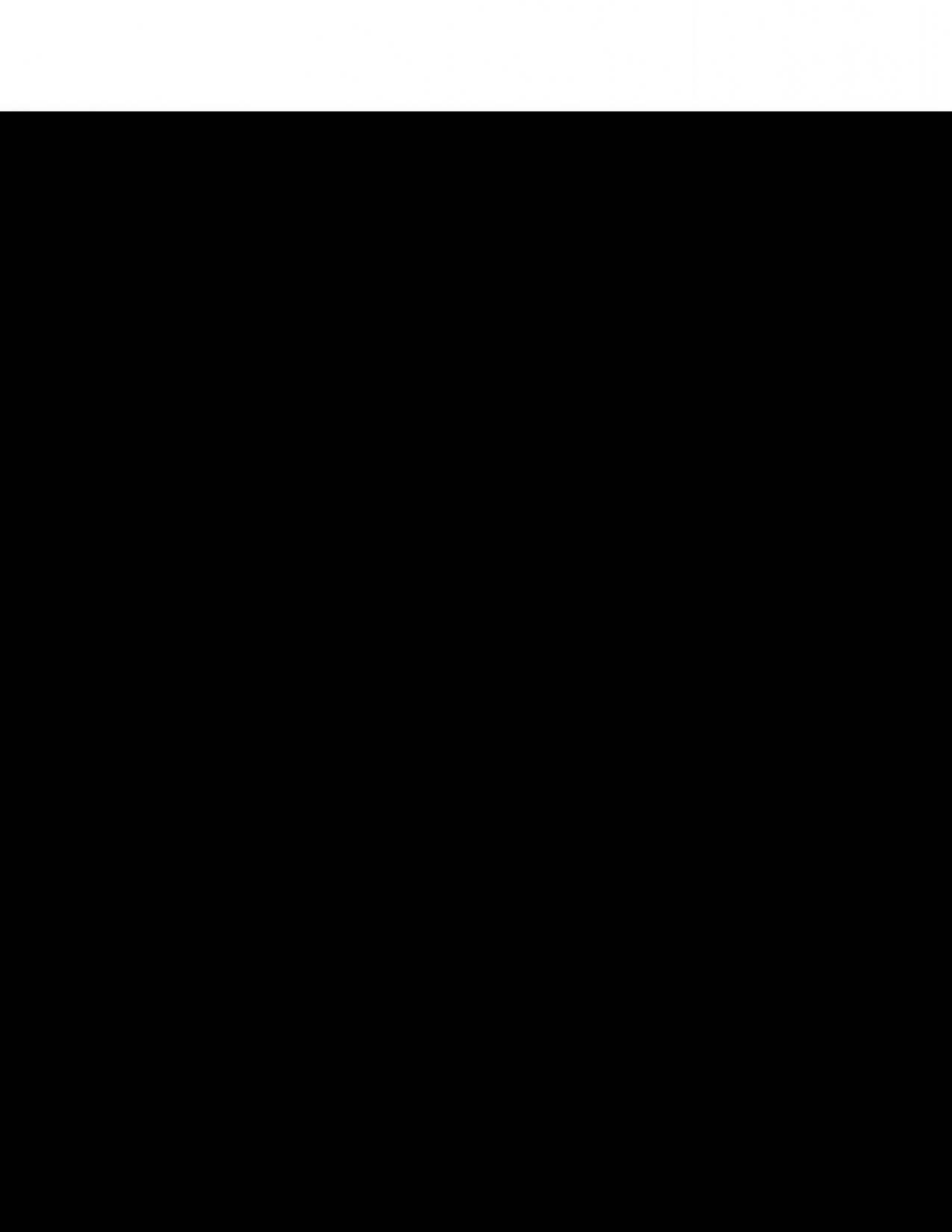
If the MTL-2 is used without the MTH-2 and the recommended EQ module then subpassband protection should be incorporated. Below the enclosure tuning frequency, cone excursion increases rapidly with little acoustic output. It is therefore highly recommended that a high-pass filter be used. A 32-Hz 12-dB-per-octave filter is sufficient. Without protection, subpassband signals may "bottom" the woofer. Damage may occur, especially if bottoming is repeated. Even if damage does not occur, amplifier power is wasted and modulation of the signal will impair performance. Woofer distortion and "muddy bass" are often caused by lack of subpassband protection.

#### LARGE-SIGNAL PERFORMANCE

Speakers have two limitations that govern their large-signal, or maximum-output performance capabilities. One is the speaker's long-term average power capacity (related to thermal, or heat destruction). The second is its maximum linear cone-excursion ability (as expressed in the Thiele-Small parameter,  $X_{max}$ ). One of the benefits of the MTL-2 Manifold Technology design is that with full power input (400 watts) the maximum recommended cone excursion of the DL18MT woofer is not exceeded for any frequency above the box-tuning frequency of 37 Hz. Therefore, the only limitation of the MTL-2 low-frequency system in the recommended frequency range is the thermal input power. Cone excursion increases substantially below 37 Hz (see Subpassband Speaker Protection section).

#### USE IN MULTIPLES

MTL-2'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 speaker systems are located side by side. For operation at very low



frequencies, the woofer cones "mutually couple," acting as one system with cone area and power-handling capacity twice that of a single system. The doubling of cone area doubles efficiency, providing a 3-dB increase in SPL. If the MTL-2's were widely spaced, the level increase tends to be limited to the 3-dB power-handling increase.

#### SYSTEM POSITIONING

Subwoofer systems such as the MTL-2 are often located on the floor. This is both convenient and can provide a desired high acoustic impact when the speakers are, for example, placed near the periphery of a dance floor. In other installations, such as a theatre or auditorium, the audible location of a subwoofer operating at sufficiently low crossover frequency (below about 150 Hz) will not be particularly evident. The other system elements operating above the subwoofer range can be positioned for the desired locational cues and uniform audience coverage.

Floor location provides the acoustic half-space environment associated with the 5% system efficiency noted in the Specifications section. Location at a floor-wall junction (acoustic quarter space) doubles efficiency (a 3-dB increase in sound pressure level) and tends to promote the full excitation of more room modes, or standing waves, important in achieving maximum overall bass output in the room. Corner placement (acoustic eighth space) doubles efficiency again and guarantees excitation of all room modes. (Such placement for maximum efficiency and room-mode excitation is not necessary and may not be desirable or possible for a variety of reasons, including esthetics and practicality.)

The MTL-2 can also be successfully operated away from any nearby acoustic boundaries, particularly when multiple systems are used for increased output ability (see Use in Multiples section), such as in a flown concert system.

#### CONNECTIONS

The MTL-2 is equipped with two Neutrik Speakon™ NL4MPR connectors. The connectors marked "INPUT" and "OUTPUT" and are

installed in parallel allowing additional MTL-2's to be attached. One mating Neutrik Speakon™ connector NL4FC is supplied with each system. These connectors are locking, self-polarizing and capable of conducting 30 amps

Pro Co Sound, Inc.  
135 E. Kalamazoo Ave.  
Kalamazoo, MI 49007

Whirlwind Music Distributors, Inc.  
P.O. Box 1075  
Rochester, NY 14603

The MTL-2 enclosure contains two DL18MT's each connected separately to the Neutrik socket. At the Neutrik socket each driver presents a nominal 8-ohm load.

The pin arrangements are:

Pin 1 - = LF1 (-)  
Pin 1 + = LF1 (+)  
Pin 2 - = LF2 (-)  
Pin 2 + = LF2 (+)

#### HANGING

The MTL-2 has been conceived to "fly" from the outset. It incorporates EV's exclusive two-point flying hardware permitting a wide range of aiming angles and maximum flexibility. The cabinet is reinforced and structurally sound allowing the MTL-2 and the MTH-2 to be combined to form tight arrays. The tracks are recessed to avoid box-to-box interference when flying and during transportation. The track mates with Aeroquip 32102 fittings.

A detailed flying manual is supplied with each system. Particular attention should be given to the safety aspects discussed. Electro-Voice accepts no responsibility if the cabinet is not used according to the recommendations given in the manual.

If the cabinet is to be permanently installed overhead, then Electro-Voice strongly recommends the removable grille be removed or screwed firmly to the cabinet.

#### WARRANTY (Limited)

Electro-Voice MT-2 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, 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 service centers is available from Electro-Voice, Inc., 600 Cecil Street, Buchanan, MI 49107 (AC/616-695-6831); and Electro-Voice West, 8234 Doe Avenue, Visalia, CA 93291 (AC/209-651-7777). Or Mark IV Audio Canada, Inc., 345 Herbert St., Gananoque, Ontario, Canada K7G 2V1 (AC/613-382-2141); Electro-Voice, S.A., Kellenstrasse 5, CH-2563 IPSACH, Switzerland (41)32-51-58-33; Electro-Voice, Ltd., 2-5-80 Izumi, Suginami-ku, Tokyo, Japan 168, (81)3-325-7900; Mark IV Vertriebs GmbH, Larchenstrasse 99, 6230 Frankfurt/Main 80, Germany (49)69-380-100; Electro-Voice Pty., 59 Waratah St., Kirrawee N.S.W. 2232, Australia (61)2-521-5322. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state or province to province.

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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