

To be used with DMC-2181 Controller.

#### SPECIFICATIONS

Frequency Response, Measured in Far Field Calculated to One Meter on Axis, Swept One-Third-Octave Pink Noise, One Watt into LF Midband, Anechoic Environment (see Figure 1):

36-100 Hz

Low-Frequency 3-dB-Down Point:

36 Hz

Crossover Frequency:

100 Hz

Efficiency:

6.1%

Long-Term Average Power Handling Capacity per EIA Standard RS-426A:

800 watts

Short-Term Power Handling Capacity (10 milliseconds):

3200 watts

Maximum Long-Term Acoustic Output:

40 watts

Sound Pressure Level at One Meter, One Watt into Speaker, Anechoic Environment, Band-Limited Pink-Noise Signal into Controller, 50-100 Hz:

98 dB

Typical Maximum Continuous Sound Pressure Level at One Meter, Anechoic Environment:

127 dB

Typical Maximum Peak Sound Pressure Level at One Meter, Anechoic Environment:

133 dB

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

2.66 dB (+0.77 dB, -0.99 dB)

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

1.84 dB (+0.36 dB, -0.37 dB)

Distortion, 120 dB SPL at One Meter, Anechoic Environment (see Figure 5),

Second Harmonic,

50 Hz: 1.4%

80 Hz: 1.2%

Third Harmonic,

50 Hz: 2.0%

80 Hz: 2.5%

Transducer Complement:

Two DL18MT 18-inch woofers

Nominal Impedance:

Two 8-ohm loads

Minimum Impedance:

Two 8.6-ohm loads

Recommended Amplifier Power (see Amplifier Requirements section):

400-800 watts each transducer or

800-1600 per enclosure

# Electro-Voice®

a MARK IV company

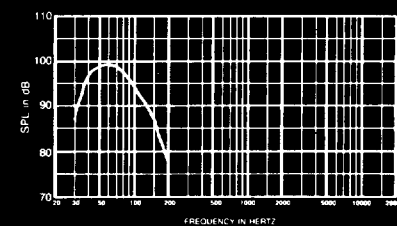


FIGURE 1 — DML-2181A/DMC-2181 Axial Frequency Response (1 watt/1 meter into LF midband)

## Model DML-2181A Series DeltaMax™ Low-Frequency Electronically Controlled Sound Reinforcement Speaker System

Input Connection:

Neutrik Speakon™ NL4MP-R

Enclosure Materials:

14-ply birch plywood

Finish:

Black textured paint

Grille:

Perforated steel with charcoal-gray foam grille cover

Hanging Hardware (DML-2181ACF only):

Six steel reinforced aircraft-type pan fittings, three on top, three on bottom (accepts Kinedyne 32326 and 32343 fittings)

Dimensions,

Height: 91.4 cm (36.0 in.)

Width: 57.2 cm (22.50 in.)

Depth: 75.9 cm (29.88 in.)

Net Weight:

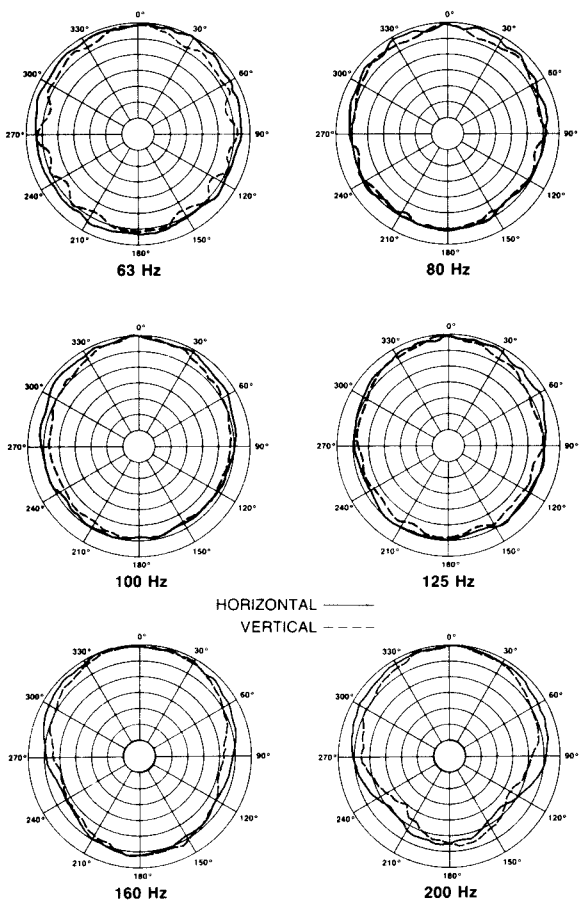
74.5 kg (164 lb)

Shipping Weight:

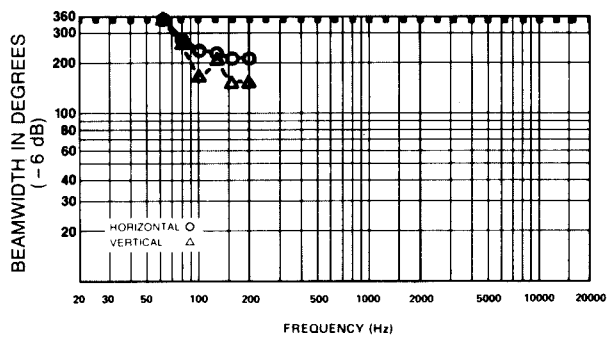
79.5 kg (175 lb)

#### DESCRIPTION

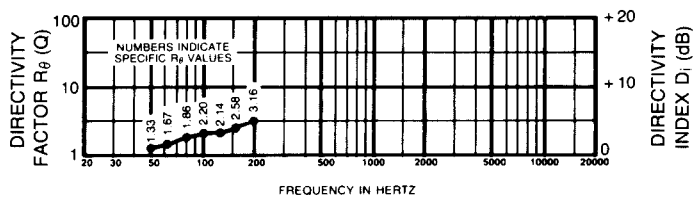
The Electro-Voice DML-2181A subwoofer loudspeaker system is part of the DeltaMax™ series and is intended for high-level sound reinforcement in touring-sound and permanent-installation applications. The DML-2181A is a dual 18-inch manifolded loudspeaker system designed to be used with the DMC-2181 dedicated electronic controller. In addition to providing conventional



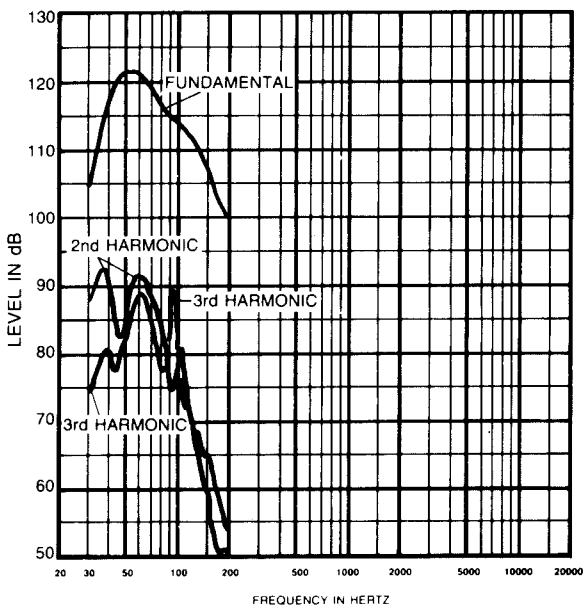
**FIGURE 2 — DML-2181A Polar Response**  
(1/3-octave pink noise, 4 volts at 20 feet)



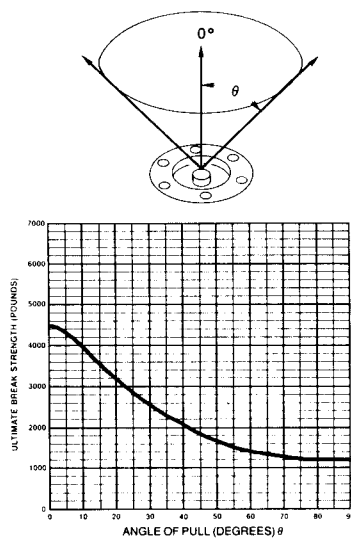
**FIGURE 3 — DML-2181A Beamwidth vs. Frequency**  
Whole Space (anechoic)



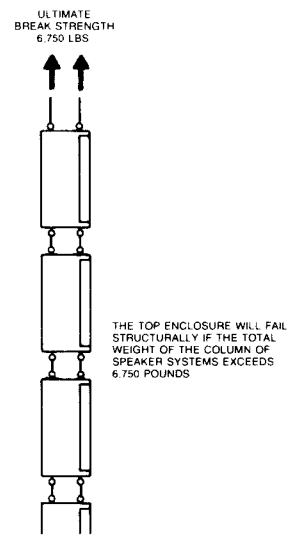
**FIGURE 4**  
DML-2181A Directivity Factor  $R_v$  (Q)  
and Directivity Index  $D_i$  vs.  
Frequency Whole Space (anechoic)



**FIGURE 5**  
DML-2181A/DMC-2181 Harmonic Distortion  
(120 dB SPL/1 meter)



6a. Break-Strength Rating of Each  
Individual Rigging Point



**FIGURE 6**  
DML-2181APF  
Ultimate-Break-Strength Ratings

frequency division, time delay and equalization, the electronic control unit offers unique speaker-protection circuitry which monitors the excursion and temperature of the woofer, as well as amplifier clipping. When an overload condition is sensed at the amplifier terminals the input signal is modified to eliminate the problem without changing the crossover frequency or spectral balance of the program material. The loudspeakers and electronics were designed as an integral package to achieve maximum acoustic output with optimal sonic quality. There are two models in the DML-2181A series: the DML-2181AP (painted finish) and the DML-2181APF (painted finish with flying hardware).

The DML-2181A is a vented-box design comprised of two DL18MT 18-inch woofers, each facing into a manifold chamber at the center of the cabinet. Manifold Technology® (U.S. Patent No. 4,733,749) results in increased acoustic loading, yielding increased low-frequency efficiency and reduced distortion over conventional direct-radiating designs. The DL18MT woofer makes use of the Electro-Voice "DL" technology that features the Thermo Inductive Ring, TIR™ and PROTEF™ coating (U.S. Patent No. 4,547,632). The TIR is a non-magnetic pole-piece extension that acts as a control on drive inductance and, more importantly, provides a major heat-transfer path from the top of the voice coil, minimizing thermal power compression. PROTEF is a Teflon®-based coating applied to the top plate that protects the voice coil during violent power peaks.

The DML-2181A enclosure is constructed of .75-inch 14-ply birch plywood and has a wear-resistant black textured paint finish suited for both touring roadwork and permanent installations. The system is in a compact rectangular shape and includes a protective steel grille covered with charcoal-gray foam. An optional flying version includes three steel-reinforced aircraft-type pan fittings on the top and bottom of the enclosure to facilitate the hanging of multi-cabinet arrays.

#### APPLICATIONS

The DML-2181A loudspeaker system is ideal for any professional touring or installation application requiring accurate low-frequency sound reproduction at high sound pressure levels from a compact enclosure. The DeltaMax™ electronic-protection technology allows the loudspeaker to be operated at full capacity with maximum fidelity and reliability. The compact cabinet shape allows tight cluster designs, enabling maximum mutual coupling and single-point-source arrays.

The DML-2181A/DMC-2181 combination is recommended for subwoofer applications where high acoustic output from 36 to 100 Hz is required. The DML-2181A/DMC-2181 were designed specifically to be used in conjunction with wide-range DeltaMax™ systems (such as the DML-1122A and DML-1152A) where extended bass at high levels is required.

In sound reinforcement applications, the addition of DML-2181A speakers will extend the low-frequency response of the system as a whole, allowing greater total sound pressure levels from the accompanying full-range speakers by removing over-excursion-causing low frequencies below 100 Hz. The entire speaker system will evidence greater output, with less distortion, over a wider frequency range.

#### FREQUENCY RESPONSE

The frequency response of the DML-2181A shown in Figure 1 was measured on axis in the far field of an anechoic environment, using a swept one-third-octave input and calculated to a one-meter equivalent distance using the inverse-square law. The system was set up using the DMC-2181 crossover, equalization and time-delay network. Drive level was set for one watt of power (2.00 volts rms into 4 ohms), delivered to the midband of the woofer section.

#### DIRECTIVITY

The polar response of the DML-2181A speaker system at selected one-third-octave bandwidths is shown in Figure 2. These polar responses were measured in an anechoic environment at 20 feet using one-third-octave pink-noise inputs and the DMC-2181 crossover, equalization and time-delay unit. The frequencies selected are fully representative of the polar response of the system. Beamwidth of the system utilizing the complete one-third-octave polar data is shown in Figure 3.  $R_{\theta}$  (Q) and directivity index (DI) is plotted in Figure 4.

#### DISTORTION

Using the DMC-2181 crossover, equalization and time-delay unit, distortion for the DML-2181A speaker system was measured in the far field with an input power that would result in a sound pressure level of 120 dB at one meter using a tailored frequency spectrum typical of contemporary close-miked rock music. Plots of second- and third-order harmonic distortion are shown in Figure 5.

#### 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 DML-2181A 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 bandwidth 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 800 watts into the EIA equivalent impedance (52.5 volts true rms) of the entire system (both woofers driven). Amplifier clipping sets instantaneous peaks at 6 dB above the continuous power, or 1,600 watts peak (105.0 volts peak) into the entire system.

#### CROSSOVER, EQUALIZATION AND TIME-DELAY PROCESSOR

The DML-2181A speaker system was designed as part of an integral package that utilizes the DMC-2181 processor. Optimal performance of the DML-2181A speaker system can only be assured when used with the DMC-2181 electronics. Use with other electronic crossovers and/or processors is discouraged.

The DMC-2181 electronic control unit has a fixed crossover frequency of 100 Hz, utilizes 24-dB-per-octave Linkwitz-Riley filters, and contains fixed time delay and equalization set for optimum performance of the DML-2181A speaker system. Protection circuitry monitors excursion and temperature of both the woofer and compression driver voice coils as well as amplifier clipping, and automatically makes adjustments to the input signal to eliminate overload conditions without altering the spectral balance. This combination enables maximum acoustic output while maintaining maximum sonic fidelity.

#### CONNECTIONS

The DML-2181A comes with 4-pin Neutrik Speakon™ NL4MP-R connectors for electrical connection to the woofers. The woofers are wired on separate pairs of pins for individual access. Each cabinet has two identical connectors: one for input signal and one for parallel wiring to connect additional DML-2181A's. One mating Neutrik Speakon™ NL4FC is supplied with each system.

Cables, connectors and wiring accessories are available for the DML speaker systems from Pro Co Sound, Inc., and Whirlwind Music Distributors, Inc. To find your local Pro Co, Whirlwind or Neutrik dealer, contact:

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

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

Neutrik USA, Inc.  
195-S3 Lehigh  
Lakewood, NJ 08701

The pin connections are as follows:

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

Each of the low-frequency inputs presents a nominal eight-ohm load to the amplifier.

#### AMPLIFIER REQUIREMENTS

The DML-2181A cabinet contains two drivers. With a 4-pin Neutrik Speakon™ NL4MP-R connector, each driver may be accessed separately. There are two ways these drivers may be wired:

1. Each driver may be connected to its own separate amplifier channel. Each amplifier channel should have a power rating of 400-600 watts into eight ohms. The amplifier channels must be identical, having the same voltage gain and power rating.
2. The two drivers may be paralleled to one amplifier channel. The speakers should be paralleled at the amplifier, not at the cabinet. The amplifier channel should have a power rating of 800-1200 watts into four ohms.

**NOTE:** DML-2181A cabinets may be paralleled (in either of the above configurations) with other DML-2181A's if the amplifier is capable of delivering adequate power at the lower impedance. The use of amplifiers with lower power ratings is acceptable, however, the DML-2181A will not realize its full power capabilities. The use of amplifiers with significantly higher power ratings is wasteful and may endanger the loudspeakers; it is not recommended. The user is instructed to consult the DeltaMax™ Owner's Manual for details. The manual is included with the DMC-2181 electronic controller.

#### HANGING

DML-2181APF is a flying-option versions of the DML-2181A series systems. Each cabinet has a total of six steel-reinforced aircraft-type pan fittings (three on the top and three on the bottom). This three-point flying system makes maximum use of the compact cabinets permitting a wide range of angle adjustments and offering maximum flexibility in array design and implementation for both the touring sound company and the sound contractor. The pan fittings mate with the Kinedyne 32343 and 32326 twelve-jaw fittings. Electro-Voice offers the DMS series of rigging hardware; a complete line of flying accessories to be used with the DML speaker systems.

The ultimate break strength of the DML enclosure and DMS rigging-strap combina-

tions are a function of the angle of pull relative to the pan fitting and the surface on which it is mounted as shown in Figure 6. The strength ratings indicated in the graph are identical for all of the DMS accessories and each of the rigging points on the enclosure.

**CAUTION:** The DML-2181APF speaker system should be suspended overhead only in accordance with the procedures and limitations specified in the Flying Manual included with the flying loudspeakers.

#### FIELD REPLACEMENT

The DML-2181A was designed for expedient field repair. To access the drivers, first remove the foam grille. The grille may be removed by simply grabbing a corner and gently peeling it off. Next, remove the screws securing the metal grille screen. The screws can be easily removed with a #2 Phillips screwdriver; the screen can then be lifted off. Remove the eight 1/4-20 hex head bolts which secure each woofer. Use a 3/8-inch nutdriver or a ratchet with a 3/8-inch socket. The woofers then slide straight out of the enclosure.

Subwoofer: Complete DL18MT 18" woofer; EV Part No.: 818-0882.

#### ARCHITECTS' AND ENGINEERS' SPECIFICATIONS

The loudspeaker system shall be a low-frequency system with performance controlled by a dedicated electronic control unit. The loudspeaker system shall have two manifolded 18-inch low-frequency woofers. Each woofer shall have an 8-ohm, 2.5-inch-diameter voice coil constructed of edge-wound rectangular aluminum wire, and shall be capable of handling a 400-watt shaped pink-noise signal with 6-dB crest factor for 8 hours (as per EIA RS-426A standard). The loudspeaker system shall have a sensitivity of 98 dB one watt at one meter from 50-100 Hz. The loudspeaker system shall have an enclosure constructed of .75-inch 14-ply birch plywood and shall have a foam-covered steel grille.

The DML-2181A loudspeaker system shall be used only with the DMC-2181 electronic control unit (see DMC-2181 spec sheet for electronic control unit architects' and engineers' specifications), having a single channel two-way crossover circuit with fourth-order Linkwitz-Riley filters, equalization, time delay and protection circuitry to prevent destruction of the low-frequency drivers due to excessive drive level. When used with the electronic control unit, the loudspeaker system shall have a low-frequency 3-dB-down point of 36 Hz and shall have a 6-dB-down high-frequency crossover point of 100 Hz.

The loudspeaker enclosure dimensions shall be 36.00 inches high, 22.50 inches wide and 29.88 inches deep and shall weigh 164 lb. Each rigging point on the enclosure (flying option only) shall have an ultimate-break-strength rating of 4,500 lb at 0 degrees, 1,800 lb at 45 degrees and 1,200 lb at 90 degrees. The overall enclosure shall have an ultimate-break-strength rating of 6,750 lb.

The loudspeaker system shall be the Electro-Voice DML-2181A (DML-2181AP and/or DML-2181APF) and the electronic control unit shall be the DMC-2181.

#### WARRANTY (Limited)

Electro-Voice DML Speakers and Speaker Systems (excluding active electronics) are guaranteed for five years from the date of original purchase against malfunction due to defects in workmanship and materials. Electro-Voice DML flying hardware (DMS rigging straps, fittings and enclosure-mounted flying hardware) is guaranteed for one year from date of original purchase against malfunction due to defects in workmanship and materials. Electro-Voice DMC electronic controllers are guaranteed for two years from date of original purchase against malfunction due to defects in workmanship and materials. Electro-Voice DML speaker accessories are guaranteed for one year 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 limitation or exclusion 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); or 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., Keltenstrasse 5, CH-2563 IPSACH, Switzerland (41)32-51-58-33; Electro-Voice, Ltd., 2-5-80 Izumi, Sugunami-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, MI 49107.

Specifications subject to change without notice.



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

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