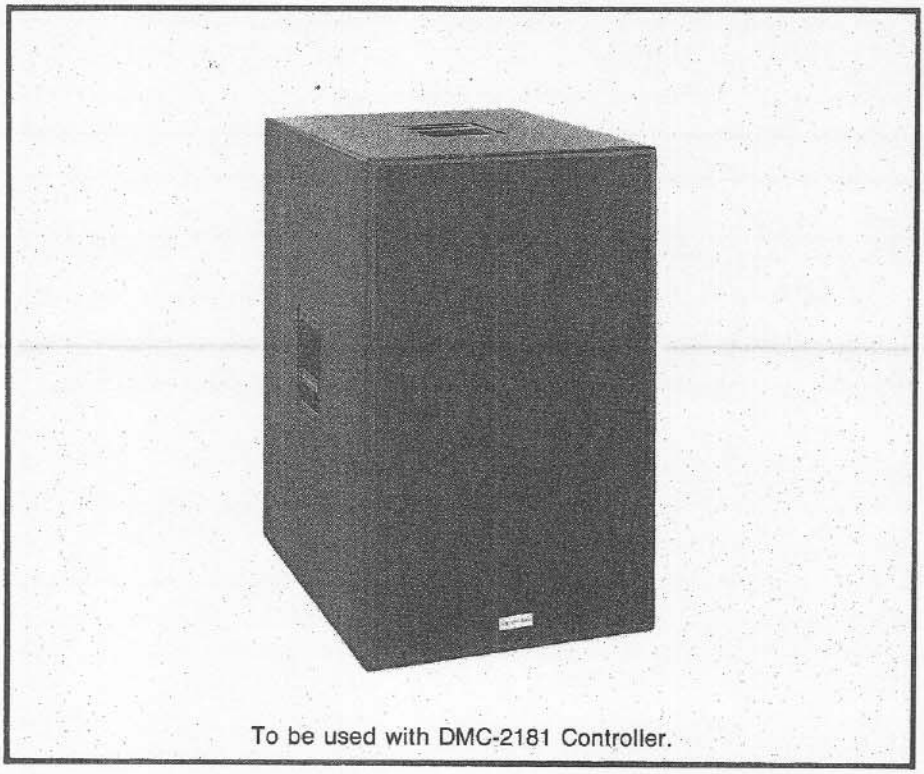

To be used with DMC-2181 Controller.

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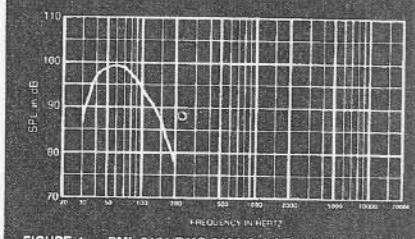

FIGURE 1 — DML-2181/DMC-2181 Axial Frequency Response (1 watt/1 meter into LF midband)

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

SPECIFICATIONS

Frequency Response, Measured in Far Field Calculated to One Meter on Axis, Swept One-Third-Octave Pink Noise, Anechoic Environment (see Figure 1):
36-100 Hz

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

Crossover Frequency:
100 Hz

Efficiency:
5.0%

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_θ (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

Input Connection:
ITT-Cannon EP-4-13 and EP-4-14

Enclosure Materials:
14-ply birch plywood

Finish:
Black textured paint

Grille:
Perforated steel with charcoal gray foam grille cover

Hanging Hardware:
Six steel reinforced aircraft-type pan fittings, three on top, three on bottom (accepts Aeroquip 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-2181 and DML-2181F (flying) low-frequency loudspeaker systems are part of the DeltaMax™ series of electronically controlled speakers intended for high-level sound reinforcement and permanent installation applications. The DML-2181 speakers are designed to be used only with the DMC-2181 electronic controller. When

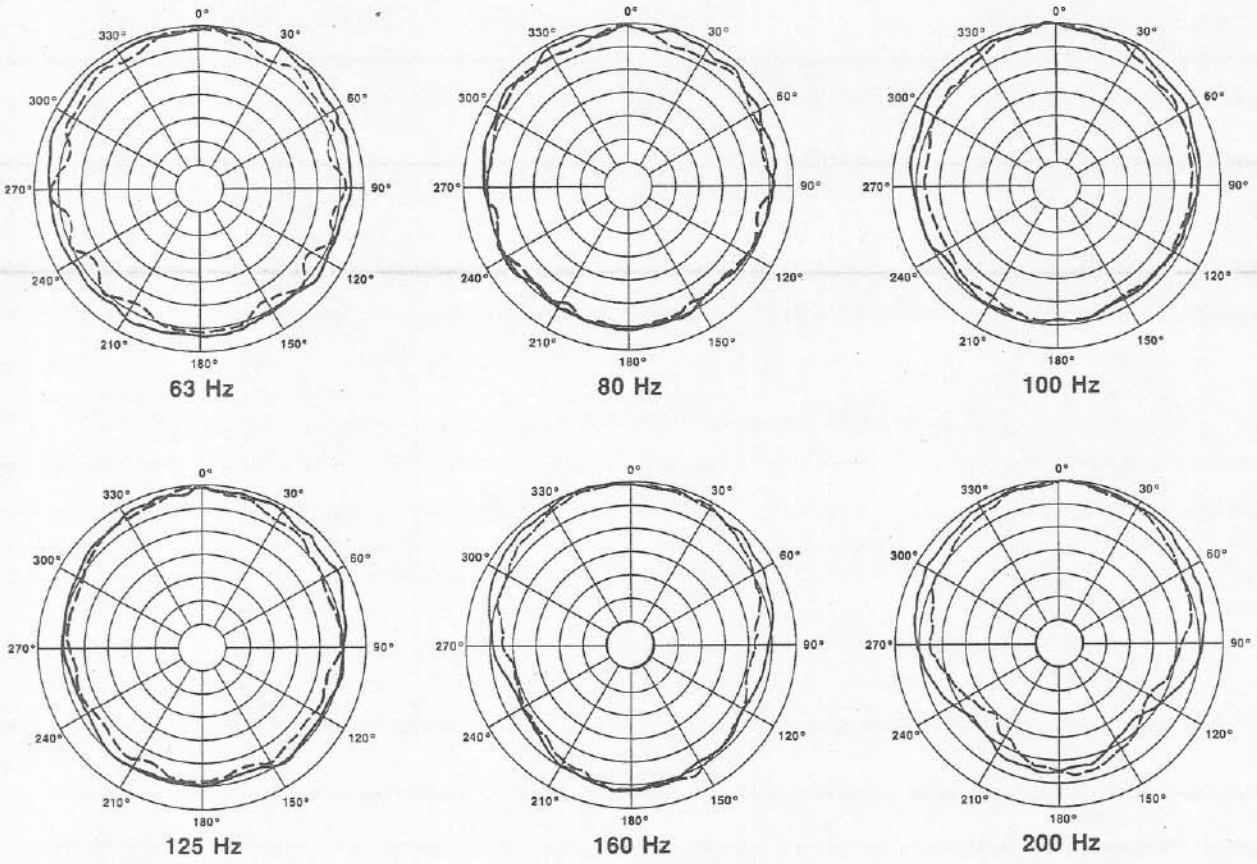

FIGURE 2 — DML-2181 Polar Response
(⅓-octave pink noise, 4 volts at 20 feet)

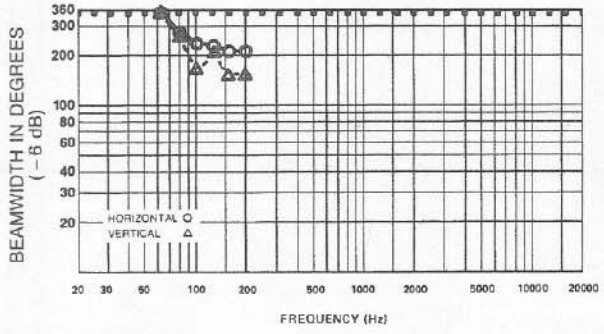

FIGURE 3 — DML-2181 Beamwidth vs. Frequency Whole Space (anechoic)

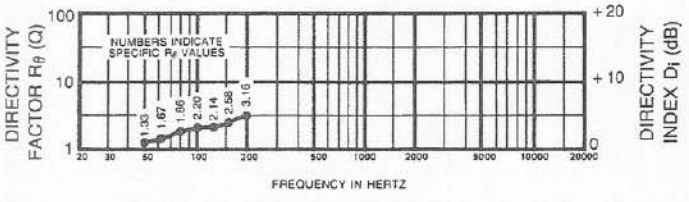

FIGURE 4
DML-2181 Directivity Factor R_θ (Q) and Directivity Index D_i vs. Frequency Whole Space (anechoic)

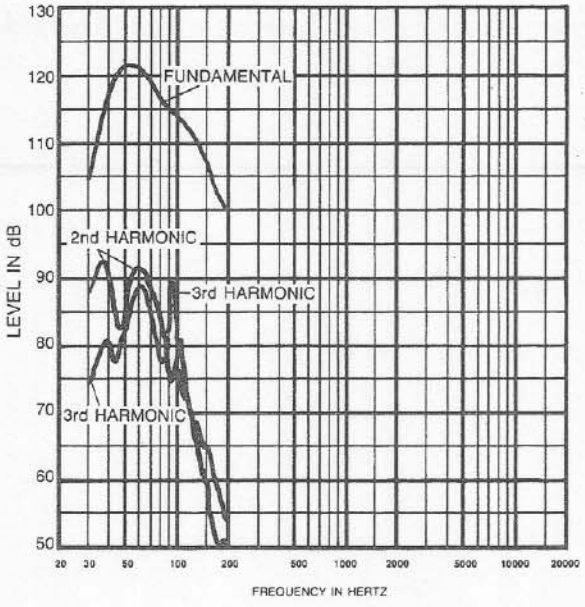

FIGURE 5
DML-2181/DMC-2181 Harmonic Distortion (120 dB SPL/1 meter)

placed in the signal path before the amplifier, the controller provides ferquency division, time-offset correction, broad-band equalization and infrasonic filtering. The controller also incorporates component performance-modelling circuitry to electronically protect the transducers from overexcursion, voice-coil overheating and amplifier clipping. The result is maximum fidelity at extreme power outputs, without sacrficiing reliability.

The DML-2181 speakers incorporate Electro-Voice Manifold Techonology® (U.S. patent no. 4,733,749) enclosure design, allowing greater output over conventional vented boxes, in a greatly reduced packaged size. Acoustic loading is improved, yielding increased low-frequency efficiency and reduced distortion over other designs. Construction consists of high grade 14-ply birch plywood, cross-braced to provide maximum integrity for portable applications and rigging. The DML-2181F utilizes steel-reinforced 3-point top-and-bottom Aeroquip hanging hardware for ease of installation in rigged arrays, with a variety of hanging straps and rings available. Each DeltaMax flying system is packed with a separate rigging manual which provides cabinet hanging information.

Two special DL18mt 18-inch high-power low-frequency transducers make up the components of the DML-2181. Each device features the TIR™ Thermo Inductive Ring, and PROTEF™ coating (U.S. patent no. 4,547,632). The TIR is a non-inductive pole-piece extension which acts as a control on drive inductance, providing a major heat transfer path from the top of the voice coil, minimizing thermal compression. PROTEF is a Teflon®-based coating applied to the inside diameter of the motor assembly's top plate, protecting the voice coil in the case of expansion due to high operating temperatures.

Optimum performance and maximum protection of the DML-2181 and DML-2181F speaker systems can only be attained in conjunction with the DMC-2181 electronic controller. DO NOT SUBSTITUTE OTHER ELECTRONIC DEVICES IN PLACE OF THE DMC-2181.

APPLICATIONS

The DML-2181 and DML-2181F loudspeakers are ideal for use in professional, high-power sound reinforcement or music playback applications, whether installed or portable. Their small size and low weight, relative to their very high acoustic output, makes them ideal for extending the low-frequency range of any high-quality sound system, as well as being complimentary to the other DeltaMax full-range electronically controlled speaker systems. True fundamental response below 40 Hz provides superior performance in discotech and club environments, where the extreme reliability, thanks to electronic protection, extends the maintenance-free life of the components. Patented Manifold Technology® allows for fewer enclosures to be used for similar or higher acoustic output than other designs.

In sound reinforcement applications, the addition of DML-2181 speakers will extend the low-frequency response of the system as a whole, allowing greater total sound pressure levels from the main (house) full-range speakers by removing overexcursion-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-2181 shown in Figure 1 was measured on axis in the far field (20 feet) of an anechoic environment, using swept one-third-octave input and calculated to one meter equivalent distance using the inverse square law. The system was measured using the DMC-2181 controller. Drive level was set at one watt of power delivered to the midband of the low-frequency range.

DIRECTIVITY

The polar response of the DML-2181 speaker system using pink noise at selected one-third-octave bandwidths, at distances calculated as above, shown in Figure 2. Beamwidth utilizing the complete polar data is shown in Figure 3. R_θ (Q) and Directivity Index D_i is plotted in Figure 4.

DISTORTION

Inherent in the Manifold Technology® design is a greatly reduced distortion component, when compared to traditional vented enclosures. Distortion quantities noted in Figure 5 were measured utilizing the DMC-2181 controller, with the measuring device placed in the far field, flat frequency response at a sound pressure level of 120 dB (reference: one meter). Protection sense lines were disconnected. Plots of second and third harmonic distortion components are shown.

POWER HANDLING

Electro-Voice was the first U.S. manufacturer of transducers to develop and publish a power test closely related to real-life actual-use conditions. First, a random-noise input signal is used containing many frequencies simultaneously, just as real program material. Second, test signal containing more energy at the extreme high and low ranges of the frequency spectrum than typical music is utilized, for an added measure of reliability. Third, test signal is used containing not only long-term average or continuous level, but also short-duration peaks which are many times higher than the average, just as actual program material. The long-term average level stresses the voice coil thermally. The instantaneous peaks test mechanical reliability, such as cone excursion. Note that the sine wave or continuous tests often used by others have much less demanding peak values relative to their average level, providing less true stress, and therefore present more inflated figures. In actual use, long-term average levels exist from several seconds on up. However, EV's application of severe stress-causing signal in a power test for many hours adds a measure of extra reliability and trust to our measured performance figures.

Specifically, the DML-2181 and DML-2181F loudspeakers are designed to withstand the power described in EIA Standard RS-426A, a test of eight hours duration utilizing signal with peak components four times above the average level (+6 dB). Using this measurement technique and including the DMC-2181 controller, maximum long-term power capacity is 800 watts per transducer or 1600 watts both speakers driven (one enclosure) from a single source. Instantaneous peak capability (10 milliseconds duration) is 1600 and 3200 watts respectively.

ELECTRONIC PROCESSOR

The DML-2181 and DML-2181F speaker systems are designed to work with the DMC-2181 electronic controller. This latter device, when placed in the line-level signal path before the amplifier(s), provides the following functions:

- Fourth-order Linkwitz-Riley crossover filters, 24-dB-per-octave, for smooth, uniform response in the crossover region. Crossover frequency is 100 Hz.
- Excursion-limiting infrasonic filtering, 12-dB-per-octave, 3-dB down at 36 Hz.
- Time-offset correction circuitry for proper speaker-stack and array alignment.
- Equalization circuitry for flat, wideband system frequency response.
- Unique protection design which utilizes modelling functions in the VCA (voltage controlled amplifier) control circuitry to detect and compensate for overexcursion, voice-coil overheating and amplifier clipping.
- Dual time-constant control functions with variable compression ratios reduce extreme peak (excursion) and average (heat) levels as necessary, while preserving relative program dynamics and full frequency response.
- Front panel display indicating input signal level, gain reduction at protection and source of protection triggering (excursion, temperature, amplifier clipping).
- Crossover output levels and amplifier-clipping threshold adjustments are located behind an included front security cover, for tamper-proof protection.
- Full-differential balanced input, high-performance transformer isolated output.
- Control voltage stacking jack, to allow uniform tracking between multiple DeltaMax controllers.
- Isolated high-impedance sense input for amplifier performance monitoring.

CONNECTIONS

The DML-2181 and DML-2181F speakers are equipped with rugged ITT-Canon EP-4 connectors, the current industry standard. A male and female connector are provided for two-cabinet combining, assuming an amplifier of high-power, high-current output into 4 ohms is used. Each transducer is wired to one circuit individually, for a total of two speakers, two circuits on two pairs of an EP-4 connector's pins. The mating connectors for the cable ends are EP-4-11-1C for the input connection and EP-4-12-1C for the loop-through connection. Cables, connectors and wiring accessories are manufacturerd for the DeltaMax loudspeaker systems by the following manufacturers:

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

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

Connections to the enclosure are arranged as follows:

Pin 1: LF 1 (–)
Pin 2: LF 1 (+)
Pin 3: LF 2 (–)
Pin 4: LF 2 (+)

Each of the low-frequency input circuits to the speakers represents a nominal 8-ohm load.

AMPLIFIER REQUIREMENTS

The DML-2181 enclosures each contain two speakers, accessible individually via two pins of the EP-4 connectors. The drivers may be connected two ways externally:

1) Each transducer may be connected to its own amplifier channel. Each channel should have a power rating of at least 400 watts into 8 ohms. Since two speakers reside in each enclosure, the necessary two amplifier channels must be identical, having the exact same voltage gain and power rating. Amplifier channels up to 800 watts may be used.
2) Two drivers may be paralleled into a single amplifier channel or a two-channel unit bridged-mono, single output. The speakers must be paralleled at the amplifier, not at the enclosure. An amplifier channel or bridged-mono output must be capable of providing a minimum of 800 watts rms into 4 ohms, but not exceed 1600 watts rms into 4 ohms.

Note: all power values assume the DML-2181 enclosures are used in conjunction with a properly connected DMC-2181 controller. Power handling ratings and total acoustic output potential are lower without the DMC in-line. Care must be taken when paralleling transducers to ensure that the driving amplifier is capable of providing full power into 4 ohms without undue stress or fatigue. Amplifier voltage gain characteristics should fall between 27 and 35 dB, with 32 dB being optimum. The use of amplifiers with lower power ratings is possible. However, the speakers will not achieve their full output potential due to premature amplifier clipping (power limitations). The use of power amplifiers with significantly higher power ratings is wasteful and is not recommended.

ENCLOSURE RIGGING/HANGING

The DML-2181F is the flying version of the subwoofer enclosure. Each cabinet has a total of 6 Aeroquip aircraft-type pan fittings recessed into the cabinet with steel reinforcing brackets distributing the weight. Three points are available on the top and bottom, utilizing Aeroquip 32343 and 32326 mating ring fittings. The three-point system allows for a wide variety of array shapes and angles, providing maximum flexibility for both touring-sound and permanent installation applications. The enclosures are certified to specific weight stress limits, typically five times over extreme application boundaries. Weight-load limits and certification documentation are available from the applications engineering staff, Electro-Voice, Inc., Buchanan, MI, 49107. DeltaMax flying/rigging system suggestions and requirements are outlined in the Flying Manual, packaged with flying-optioned enclosures.

Caution: DeltaMax speaker systems should only be suspended overhead in accordance with procedures and limitations outlined in the Flying Manual.

FIELD REPLACEMENT

All DeltaMax loudspeakers are designed for expedient field service. The DML-2181 transducers may be removed using a ⅜-inch nutdriver or a rachet with a ⅜-inch socket to remove the eight ¼-20 hex-head bolts per transducer. The woofers slide straight out of the front of the enclosure.

Components: (2X) Complete DL18mt 18-inch woofer, EV part number 818-0882.

WARRANTY (Limited)

Electro-Voice Speaker and Speaker Systems (excluding active electronics) are guaranteed for 5 years from the date of original purchase against malfunction due to defects in workmanship and materials. Electro-Voice DML flying hardware items (DMS rigging straps and enclosure-mounted flying hardware) are guaranteed for one year from date of original purchase against malfunction due to workmanship and materials. Electro-Voice Professional Sound Electronic Components are guaranteed for two years from the date of original purchase against malfunction due to defects in workmanship and materials. 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 every situation. If a warranty-covered malfunction occurs, unit will be repaired or replaced at the option of Electro-Voice without charge for materials or labor, if delivered prepaid to the proper EV service facility. Unit will be returned prepaid. 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 (616-695-6831); Electro-Voice, Inc., 3810 148th Avenue N.E., Redmond, WA 98052 (206-881-9555); and/or Electro-Voice West, 8234 Doe Avenue, Visalia, CA 93291 (209-651-7777). This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Service and repair address for DMC-2181 controller: Electro-Voice, Inc., 3810 148th Avenue N.E., WA 98052.

Service and repair address for the DML-2181 and 2181F speakers: 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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