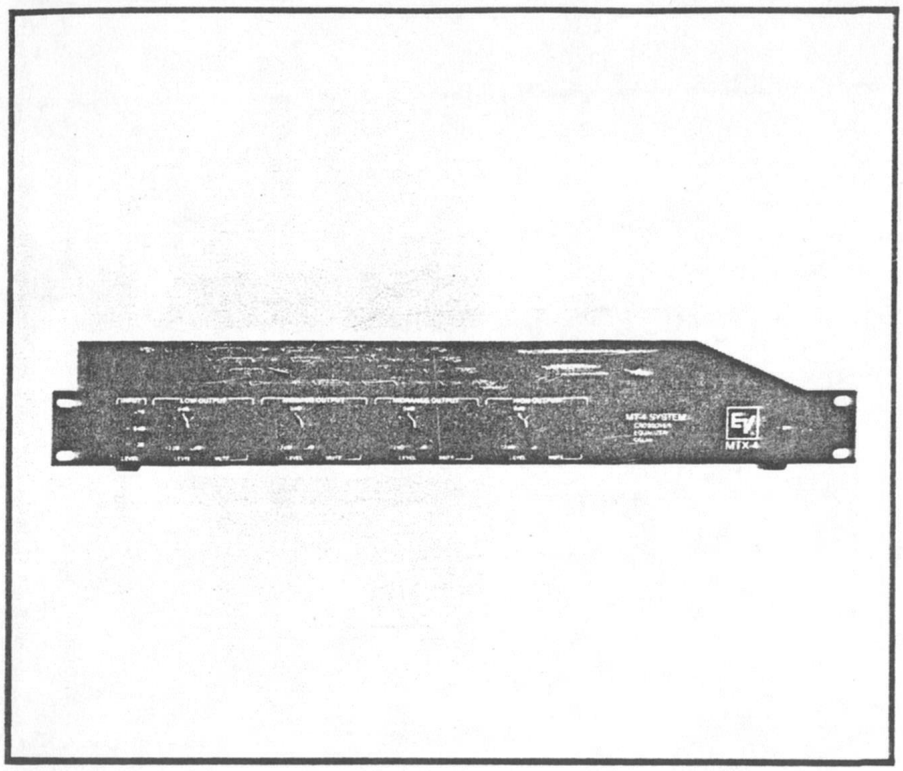

Electro-Voice®
a MARK IV company

Model MTX-4
Electronic Crossover/Equalizer/Delay Unit

GENERAL SPECIFICATIONS[1]

Channel Configuration:
Monaural four-way

Filter Type:
Fourth-order Linkwitz-Riley (24-dB-per-octave attenuation)

Crossover Frequencies,
Low: 160 Hz
Midbass: 1,600 Hz
Midrange: 8,000 Hz

Output Delays,
Type:
Fourth-order all-pass
Range:
Low: 3.0 ms at 160 Hz
Midrange: 400 µs at 1,600 Hz
High: 100 µs at 8,000 Hz

Infrasonic Speaker Protection,
Filter Type:
Third-order Butterworth (18-dB-per-octave slope)
Corner Frequency:
32 Hz

Input,
Type:
Active differential
Maximum Level:
+18 dBu
Impedance:
20,000 ohms
Common-Mode Voltage Range:
±24 V (net of signal voltage)
Common-Mode Rejection Ratio, Typical:
−55 dB at 1 kHz
Connector:
Female 3-pin XLR type

Main Outputs,
Type:
Active floating differential (transformer coupling kits are available as an accessory)
Maximum Level:
+18 dBu[2]
Impedance:
100 ohms
Minimum Load Impedance for Full Output Level:
600 ohms
Protection:
Safe for short circuit or ±25 volts dc
Connectors:
Male 3-pin XLR type

Gain,
Level Controls at Center Detent:
Low: −1 dB
Midbass: −12 dB
Midrange: −10 dB
High: 0 dB
Adjustment Range re Center Detent, Continuously Variable:
±12 dB

Total Harmonic Distortion, 20-20,000 Hz,
Typical:
0.02%
Maximum:
0.1%

Noise, Each Output, Controls Flat, 20-20,000-Hz Noise Bandwidth, Typical:
−90 dBu

Channel Crosstalk, Typical:
−65 dB

Transient Performance:
Not limited by slew rate or power bandwidth under any normal operating condition, 20-20,000 Hz

LED Level Indicators (level-dependent brightness provides enhanced resolution),
Green:
Input level above −20 dBu
Yellow:
Input level above 0 dBu
Red:
Input or any output level above +16 dBu

Front-Panel Controls, Each Output:
Gain and channel mute

Chassis Construction:
Painted steel

Colors:
Black with white graphics

Mounting:
Standard 19-in. rack panel, 1¾ in. high, 7 in. deep behind panel

Optional Accessory:
TRB-1 set of two output isolation transformers (two sets required)

Power Requirements:
100-120 V ac, 50-60 Hz, 12 W (also available for 80-110 and 220-240 V ac, 50-60 Hz)

Overall Dimensions (see Figure 1),
Height: 44 mm (1.73 in.)
Width: 483 mm (19.0 in.)
Depth: 185 mm (7.28 in.)

Net Weight:
2.84 kg (6 lb. 4 oz)

Shipping Weight:
3.35 kg (7 lb. 6 oz)

1. All measurements made at 25°C (77°F).
2. 0 dBu is 0.775 volts RMS sine wave. At the minimum load impedance of 600 ohms, dBu figures may also be read as dBm, a power measure where 0 dBm is 1 mW into 600 ohms.

DESCRIPTION

The MTX-4 electronic crossover/equalizer/delay unit is dedicated to the MT-4 Manifold Technology™ concert sound loudspeaker system. This signal processor, with fixed crossover frequencies, equalization, and time delay, was designed to obtain optimal performance from the MT-4. A brief description of the MT-4 appears in the MT-4 Speaker System section.

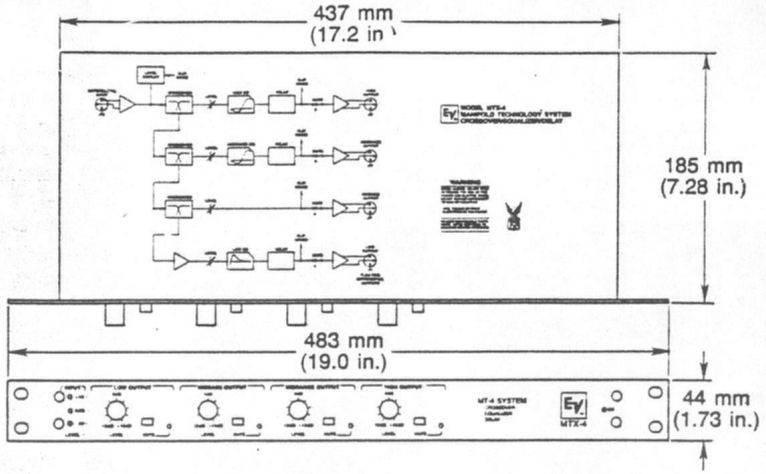

FIGURE 1 — Dimensions

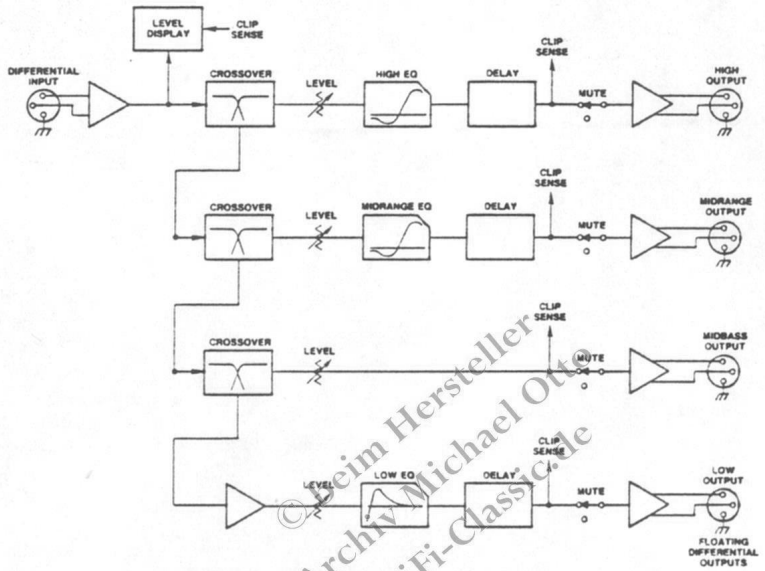

FIGURE 2 — MTX-4 Block Diagram

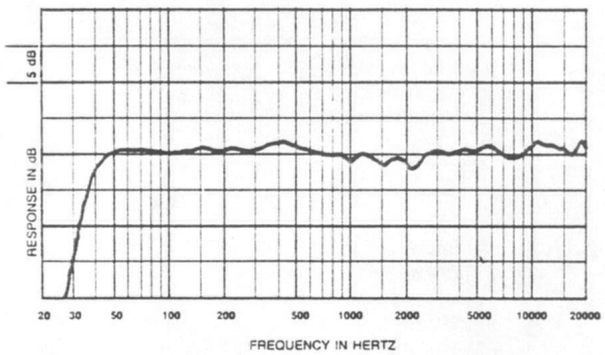

FIGURE 3 — Typical MTX-4/MT-4 System Frequency Response

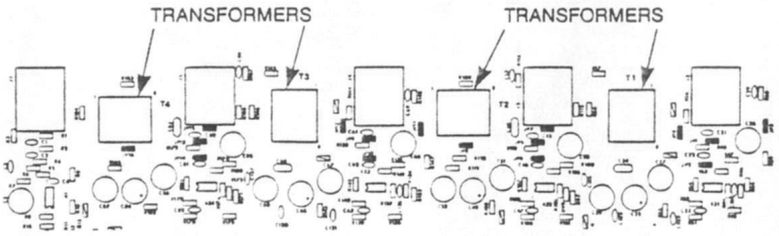

FIGURE 4 — Transformer Mounting Locations (Jumpers to cut are shown as solid rectangles)

The crossover section of the MTX-4 is a 4-way fourth-order Linkwitz-Riley frequency-dividing network. This configuration has two unique advantages over a third-order Butterworth network. First, a fourth-order network offers an out-of-passband attenuation rate of 24 dB per octave, greater than the 18-dB-per-octave rate of a third-order network. This provides better protection of drivers from energy outside their intended frequency range. Second, the use of a Linkwitz-Riley network results in zero lobing error, and smoother overall frequency response in the crossover region. See the Linkwitz-Riley Network section for more information about lobing error.

Other features include a differential input and a level display for optimizing dynamic range. Each output section has a level control with a mute switch. The outputs are normally floating active differential. They may be transformer coupled by installing two of the TRB-1 transformer kits. The MTX-4 mounts in one EIA rack space. Figure 2 shows the MTX-4 block diagram.

EQUALIZATION SECTIONS

Midrange and High-Frequency Equalization

The midrange and high-frequency equalization circuits accurately equalize the high-performance compression driver/constant-directivity horn combinations in the MTH-4. This EQ is necessary because all horn/driver combinations that combine high overall efficiency with constant directivity exhibit a high-frequency power-response roll off.

Low-Frequency Protection

A high-pass filter, with a corner frequency of 32 Hz, protects the speaker from infrasonic frequencies. The overall system acoustic corner frequency is 37 Hz.

TIME DELAY

Three of the four outputs on the MTX-4 have a time-delay circuit which corrects for the time and phase-response differences which exists due to path-length differences of the MT-4 Speaker System. The delay sections are four-pole all-pass filters. A delay is acoustically equivalent to physically moving the corresponding speaker with respect to the others. The midbass output does not have a delay network since it is the rear-most section of the speaker system in a normal setup.

CONNECTIONS

Inputs and Outputs

The input connector is a 3-pin female XLR type; output connectors are 3-pin male XLR types. Pins 2 and 3 are signal and each pin 1 is connected through a 10-ohm resistor to chassis ground. This grounding arrangement works well in most installations; pin 1 can be used as a ground reference or, if there is another reference (a ground loop is formed), then the resistor allows pin 1 to follow the other ground reference. A solid chassis ground connection can be obtained at the connector shell.

The floating-differential input and outputs can be unbalanced and referenced to other equipment, or they can be connected to balanced lines. If a true balanced source (or load) is needed, connect a 300-ohm resistor from pin 2 to pin 1 and another 300-ohm resistor from pin 3 to pin 1.

Power

A green LED on the front panel indicates when ac power is on. The power supply is designed so that the unit can deliver +18 dBu at line voltages as low as 90 V ac. The MTX-4 may be left on indefinitely or externally switched with other equipment.

CONTROL FUNCTIONS

Input Level Indicator

The level of the input signal to the MTX-4 is monitored with three LED's. The green LED indicates signal above −20 dBu, and the yellow LED lights when the signal reaches 0 dBu. The red LED lights if the input or any output exceeds +16 dBu. In normal operation, the yellow LED should light much of the time (indicating normal signal level) but the red LED should not light.

Level Controls

Each of the four outputs has a level control with a ±12 dB range. If the power amplifier channels have equal gain, then the center detent position is calibrated for flat MT-4 system frequency response in an anechoic environment (see Figure 3). The level controls are intended for fine-tuning the system response; large differences in power amplifier sensitivities should be compensated by adjustment of the power amplifier attenuators.

Mute Switches

Four mute switches are located on the front panel. When a mute switch is pressed, the corresponding output will be disabled and a red LED lights to indicate the muted output. These switches are useful for setup, calibration, and troubleshooting.

OUTPUT TRANSFORMERS

The outputs of the MTX-4 can be transformer coupled by installing two of the optional TRB-1 transformer pairs. This should be done by a qualified service technician. Remove two screws from each side and the back, and lift off the top cover. Then remove the three screws holding the circuit board to the chassis, and four hex screws from the front panel. The circuit board, with the front panel attached, can then be removed from the chassis.

There are sixteen jumpers which must be removed from the board so that the transformers will have the proper drive, feedback and output connections. The jumpers are labeled JP1 through JP16 (see Figure 4). To remove a jumper, clip the lead at each end and remove the center section.

The transformer lead layout is asymmetrical, so verify the orientation of the transformer leads with the holes in the circuit board before installing. Solder all connections on the foil side of the board. Reassemble the MTX-4 in reverse order from the description above.

MT-4 SPEAKER SYSTEM

The MT-4 is a two-box, four-way active loudspeaker system utilizing Manifold Technology (patents pending) over the entire audio frequency range. One enclosure is the MTL-4 low-frequency system, a vented-box design comprised of four 18-inch woofers, each facing into a manifold chamber at the center of the cabinet. The second enclosure is the MTH-4 midbass/midrange/high-frequency system, a three-way horn-loaded system utilizing four drivers in each frequency range for a total of twelve drivers in a remarkably small package. The technique of manifolding, perfected by Electro-Voice engineers, effectively sums the output of four loudspeakers, producing from the four a single coherent source. The advantages of manifolding over multiple sources are improved directivity control and audience coverage, reduced polar lobing, extremely high power-to-enclosure-volume ratios, and in some instances reduced distortion and increased efficiency.

LINKWITZ-RILEY NETWORKS

Linkwitz-Riley networks have zero lobing error because their outputs are (1) in phase in the crossover region and (2) 6 dB down at the crossover frequency. (The outputs of a third-order Butterworth network are 90 degrees apart and 3 dB down at the crossover frequency.)

The acoustic consequences of zero lobing error can be appreciated by considering a two-way speaker system. For simplicity, assume that the sound from each transducer radiates from exactly the same vertical plane, i.e., the drivers have no time delay with respect to each other. Under these conditions:

1. A Linkwitz-Riley network promotes smoother overall frequency response in the crossover region, considering observation points both on and off the system axis. Frequency response is flat on the system axis and there are no off-axis response peaks. In contrast, when a third-order Butterworth network provides flat response on axis, a 3-dB peak must appear off axis, at that angle where the

time delay due to different distances from the listener puts the two transducer outputs exactly in phase.

2. A Linkwitz-Riley network places the inevitable interference dips (due to two transducers providing output in the same frequency range) symmetrically above and below the system axis. The lobe in between is aimed along the system axis. In contrast, a third-order Butterworth network aims the lobe at some angle relative to the system axis, a consequence of the 90-degree phase difference between the outputs of the network. The angle of the lobe is the location of the Butterworth response peak described above.

A more detailed and graphic treatment of the subject is available in a number of technical articles, including:

1. S.H. Linkwitz, "Active Crossover Networks for Noncoincident Drivers," *J. Audio Eng. Soc.*, vol. 24, pp. 2-8 (1976 January/February).

2. S.P. Lipshitz and J. Vanderkooy, "A Family of Linear-Phase Crossover Networks of High Slope Derived by Time Delay," *J. Audio Eng. Soc.*, vol. 31, pp. 2-20 (1983 January/February).

WARRANTY (Limited)

Electro-Voice Professional Sound Reinforcement Electronic Components are guaranteed for two 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 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); 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., 3810 148th Avenue N.E., Redmond, WA 98052.

Specifications subject to change without notice.

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

MANUFACTURING PLANTS AT ■ BUCHANAN, MI ■ NEWPORT, TN ■ SEVIERVILLE, TN ■ REDMOND, WA ■ GANANOQUE, ONT

Part Number 700124—552

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