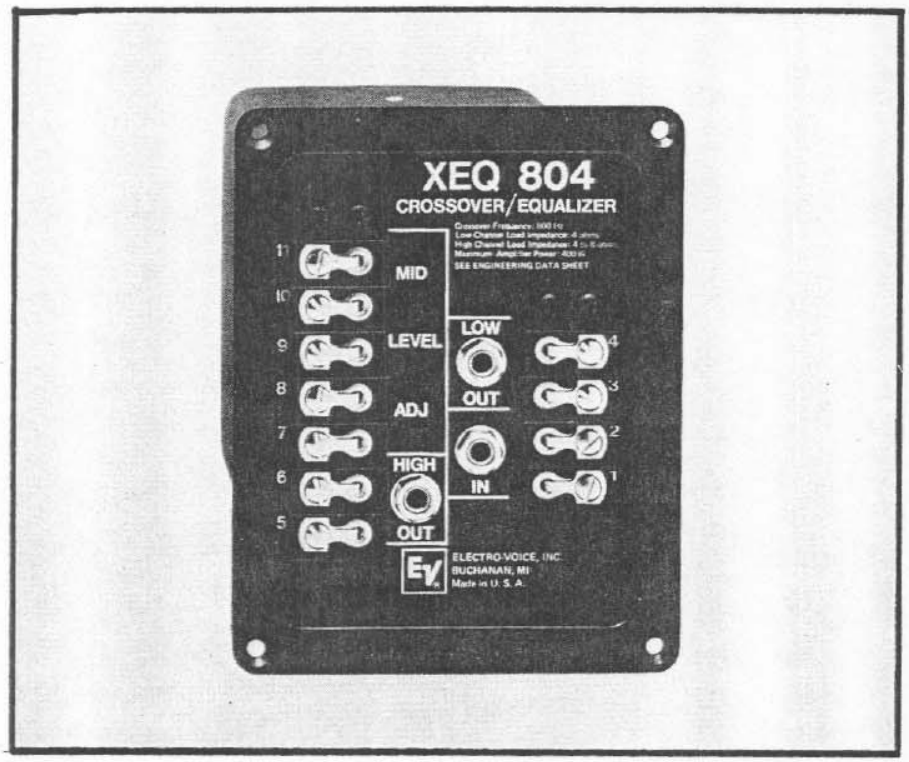

Electro-Voice®
a gulton company

Model XEQ 804
Crossover/Equalizer

SPECIFICATIONS

Nominal Crossover Frequency:
800 Hz

Nominal Load Impedance, Low Channel:
4 ohms

Nominal Load Impedance, High Channel:
4 to 8 ohms

Attenuation Rate Outside of Crossover Region,
Low-Pass Output:
12 dB per octave
High-Pass Output:
18 dB per octave except 12 dB per octave on high-frequency attenuation adjustment F (see Figure 4)

Equalization at 10,000 Hz:
Approximately 10 dB above 1,000 Hz reference (varies slightly with high-frequency attenuation adjustment)

High-Frequency Attenuation (1,000 Hz):
9–16 dB, adjustable in six steps

Insertion Loss,
Low-Frequency Channel:
0.7 dB typical

Maximum Safe Amplifier Power Rating with Typical Program Material (maximum voltage input not to be exceeded):
400 watts continuous sine wave

Long-Term Average Power Handling Capacity:
100 watts shaped random noise per EIA Standard RS-426A

Maximum Input Voltage:
±80 volts peak

Circuit Type (see Figure 6),
Frequency Division:
Second-order L-C
High-Frequency Equalization and Attenuation:
Adjustable series capacitance

Connectors:
Barrier terminal strips in parallel with 1/4-inch phone jacks

Maximum Wire Gauge, Barrier Terminal Strips:
AWG 10

Dimensions,
Overall (including flange):
178 mm (7.00 in.) high
140 mm (5.50 in.) wide
164 mm (6.44 in.) deep
Depth Behind Flange:
160 mm (6.31 in.)

Net Weight:
3.43 kg (7.56 lb)

Shipping Weight:
3.73 kg (8.22 lb)

DESCRIPTION

The Electro-Voice XEQ 804 crossover/equalizer combines a passive high-level frequency-dividing network with a high-frequency equalization circuit. This unique combination, heretofore unavailable, provides essentially flat overall frequency response in two-way systems utilizing compression drivers. Conventional crossover networks cannot provide this performance. The XEQ 804 is designed for 4-ohm low-channel loads and has a nominal crossover frequency of 800 Hz. The high-frequency channel accommodates one 4- or 8-ohm driver, or two 8-ohm drivers. Attenuation rates outside of the crossover region are 12-dB-per-octave for the low-pass output and 18-dB-per-octave for the high-pass output for adjustments A-E (see Figure 4). High-frequency attenuation for adjustment F provides a rate of 12-dB-per-octave. Designed for high-output systems, the XEQ 804 may be safely used with amplifiers of up to 400 watts continuous sine wave output rating on typical program material.

The high-frequency equalization compensates for the falling high-frequency response of a high-performance compression driver used with a constant directivity horn. This falling response occurs because the efficiency of all compression drivers begins to decrease above about 2500 Hz. When the driver is placed on a constant directivity horn — one which spreads driver output over a uniform coverage angle throughout the frequency range — the response of the driver/horn combination falls. The XEQ 804 compensates for this characteristic. In addition, adjustable attenuation matches the sensitivity of compression drivers to a lower sensitivity of direct-radiator bass systems. This equalization and attenuation are achieved without resistive losses.

The XEQ 804 is ideally suited for the Electro-Voice DH1012A and DH1506 compression drivers when used with the HR and RC series constant directivity horns and the TL606D and TL806D low-frequency systems. A typical frequency response is illustrated in Figure 1. The XEQ 804 may also be used with other 4-ohm low-frequency systems and driver/horn combinations. In this regard, adjustment F will allow the crossover to function in a manner similar to conventional unequalized passive crossovers.

Excellent performance and reliability are achieved through the use of highest quality components. Air-core inductors are used throughout to avoid any harmonic or intermodulation distortion which otherwise can result from core hysteresis and saturation. Polypropylene capacitors in the high-frequency channel result in negligible dielectric losses.

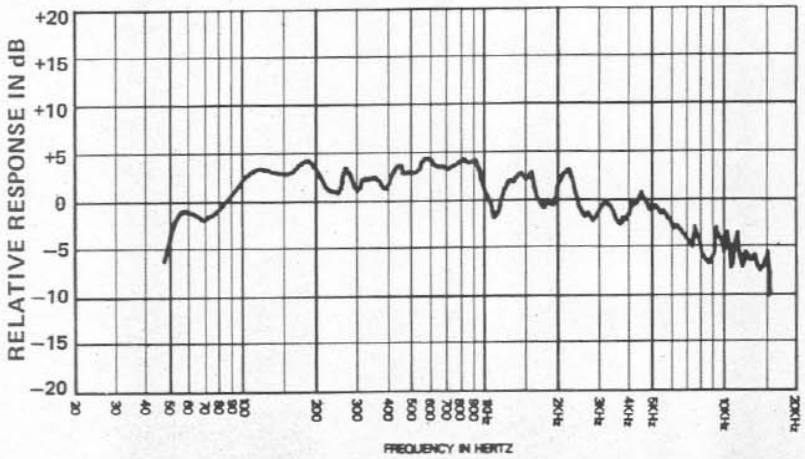

FIGURE 1 — Typical Anechoic Frequency Response of System Using XEQ 804 (with DH1506/HR90/TL606A)

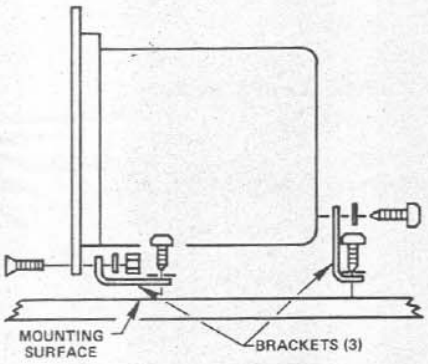

FIGURE 2a — Surface Mounting

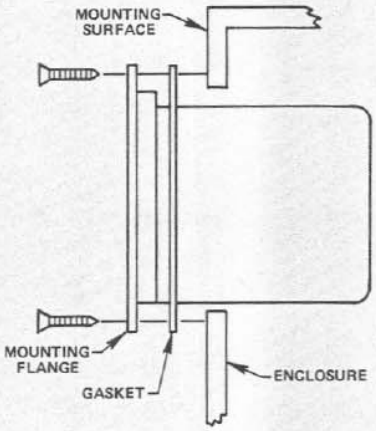

FIGURE 2b — Flush Mounting

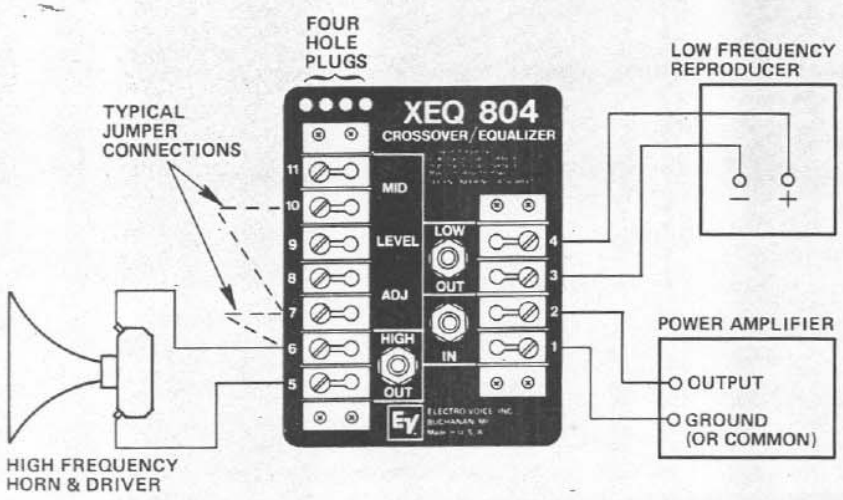

FIGURE 3 — Typical Connections of XEQ 804

Adjustment of the high-frequency attenuation is made by strapping various screw terminals together. This method avoids the possibility of intermittent contact or resistance variation in a switch or potentiometer.

Connections can be made to the XEQ 804 in either of two ways. For portable installations, standard 1/4-inch phone jacks are provided. For fixed installations, use of the barrier terminal strips is recommended. These strips will accommodate either a terminal lug or bare wire. Since each jack and the corresponding terminals are internally connected, a combination of these methods is possible.

The crossover is housed in a steel enclosure, finished in non-reflecting black enamel. The enclosure is electrically isolated, permitting it to be mounted on any conductive surface without the possibility of generating a system ground loop. Surface mounting may be accomplished by using the three brackets and hardware provided, or it may be flush-mounted in a rectangular opening cut in the speaker enclosure. For enclosure mounting, a gasket is provided to eliminate air leakage, and leadwire holes are provided for access into the cabinet.

MOUNTING

Hardware has been supplied with the crossover to allow installation either (1) through a cutout in the low frequency transducer cabinet (flush mounting), or (2) fastened upon any convenient surface. When surface mounted, the crossover can be positioned with its larger dimension either parallel to, or at right angles to the surface. Since the exterior of the crossover is electrically isolated from all circuitry, mounting on a conductive surface is permissible. Although magnetic shielding is provided by the steel enclosure, good practice dictates that the crossover should not be located in the immediate vicinity of high power transformers, motors, or other inductive devices.

Surface Mounting (see Figure 2a):

1. Determine the desired orientation of crossover.
2. Temporarily remove the appropriate screw on the rear of the crossover and attach a mounting bracket using this screw with a lockwasher under its head. Note that the screw passes through a hole in the longer arm of the bracket.
3. Using two 1/2-inch flat head screws, install two brackets behind the front flange of the crossover, with lockwashers under the hex nuts. Note that these screws pass through the hole in the shorter arm of the bracket.
4. Position the brackets against the desired mounting surface and mark locations for three screw pilot holes.
5. Drill pilot holes where marked, using a 5/32-inch (.156) drill

and install the crossover using three 3/4-inch screws supplied with lockwashers under the heads.

Flush Mounting (see Figure 2b):

1. Using the template provided, cut an opening in the desired mounting surface and mark the location of the four mounting screws. Be certain that there are at least 6-5/16 inches of clearance behind the surface.
2. Drill pilot holes as marked, above, using a 5/32-inch (.156) drill.
3. Peel and discard paper backing (if present) from the gasket supplied, place it over the rear of the crossover, and push it into position against the rear of the mounting flange.
4. Insert the crossover into the cut-out and secure it with the four 1-inch flat-head screws supplied.
5. If it is necessary to make connection to a component inside the enclosure, remove as many rubber plugs (located at the upper left of the crossover nameplate) as needed, and pass the insulated wires through the holes thus exposed.

Properly installed, there should be no air leakage or vibration which could degrade acoustical performance.

CONNECTION

Connection to the crossover may be made either by means of the barrier terminal strips, the one-quarter-inch phone jacks, or a combination of the two. Refer to Figure 3 for the wiring diagram. Although use of the terminal strips is recommended for all permanent installations, the phone jacks may be more convenient in many portable or temporary systems. Jack bushings (sleeves) are tied to terminal numbers 1, 3, and 5. Jack center contacts are tied to terminal numbers 2, 4, and 6.

The XEQ 804 has been designed to minimize signal power loss. Care should likewise be taken to minimize system losses external to the crossover. All connections should be tight and clean, and adequate wire size should be used in the speaker circuits. Power loss is directly proportional to the total wire length between the power amplifier and loudspeakers. Table 1 shows cable lengths which result in typical losses in a 4-ohm circuit.

AWG Wire Gauge	Resistance Ohms/1000 Feet	Cable Length in Feet For 0.5 dB Loss	For 1.0 dB Loss
10	1.00	119	238
12	1.59	75	150
14	2.53	47	94
16	4.02	30	60
18	6.39	19	37

Table 1 – Two-Wire Copper Cable Length vs. Power Loss for an 4-Ohm Circuit.

The barrier terminal strips provided accomodate up to 10 gauge wire. During installation, the wire ends should be carefully scraped clean, and the

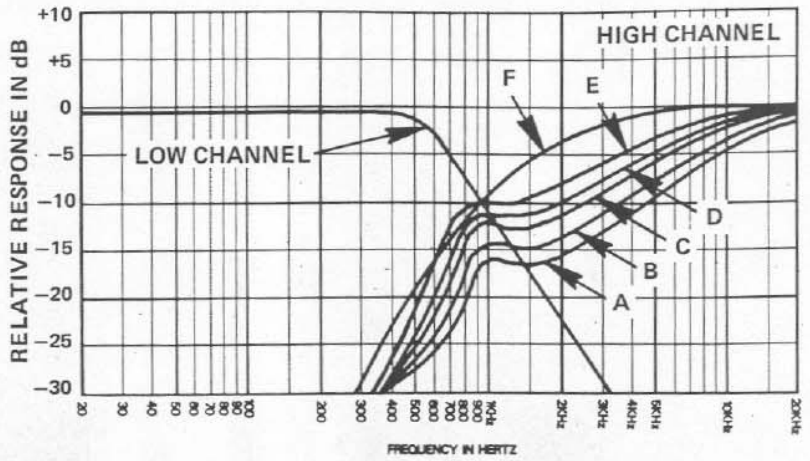

FIGURE 4 – XEQ 804 Frequency Response with Resistive Loads:
Low channel – 4 ohms
High channel – 8 ohms

	← MORE ATTENUATION (SEE CURVES A-E, FIGURE 4)						
	Curve A:	Curve B:	Curve C:	Curve D:	Curve E	Curve F:	CURVE
	1.5 mfd.	2.0 mfd.	3.0 mfd.	4.0 mfd.	6.5 mfd.	Bypass	COUPLING CAPACITOR
HORN MODEL	No Jumper	Jumper 6-7	Jumper 6-7; 7-8	Jumper 6-7; 7-10	Jumper 6-11	Jumper 6-9	JUMPER
HR40		DH1506 DH1012A					
HR60		DH1012A	DH1506				
HR90				DH1506 DH1012A			
HR120 SM120				DH1012A	DH1506		
HR4020A		DH1506 DH1012A					
HR6040A		DH1012A	DH1506				
HR9040A				DH1506 DH1012A			

FIGURE 5 – Horn/Driver Attenuation/Equalization Chart

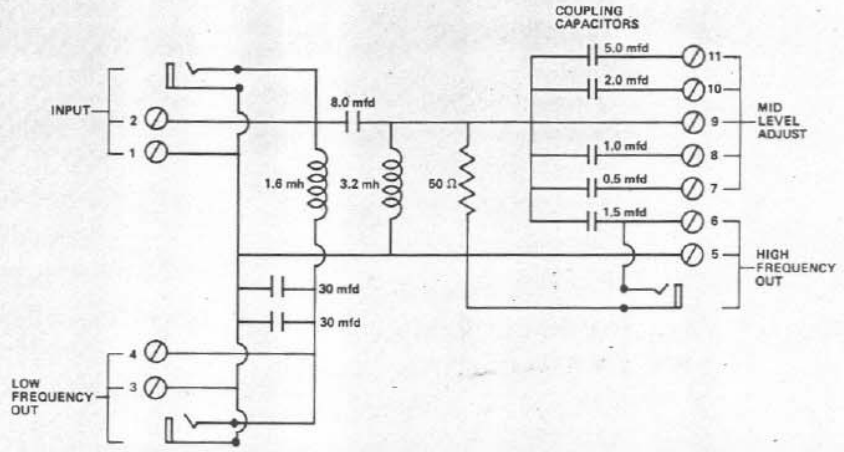

FIGURE 6 – XEQ 804 Schematic

terminal screws tightened securely. However, if more than one wire need be connected to a screw terminal, as when two horn drivers are employed, it may be found more convenient to use lugs. To insure a reliable connection, it is recommended that the lugs be soldered, as well as crimped, to the wire leads. Stranded speaker wire should be used with phone plugs, and should be soldered to the plug terminals. Unused terminal screws should be tightened to avoid vibration and eventual loss.

CAUTION: As is true of any high level passive crossover, it is important that a load be connected to both the high- and low-channel outputs before applying a signal to the input. This avoids the possibility of damage to the crossover and to the driving amplifier. If only one output channel is to be used, a 4- to 8-ohm load resistor should be connected across the unused output. For typical program material input, this resistor should have a power rating of at least 25% of the amplifier output rating.

POLARITY

In the crossover region of 800 Hz, there is comparable acoustic output from the high- and low-frequency reproducers. It is therefore desirable that they be connected to avoid out-of-phase sound cancellation between them. To achieve the proper connection, both the phase characteristics of the drivers and phase rotation within the crossover network must be considered. Also important is the physical placement of the reproducers with respect to each other. It is usually desirable to equalize the acoustic path lengths from the horn driver diaphragm and low-frequency speaker cone to the listener's location.

For the proper phase relationship, following are the normal polarity connections:

	Terminal Number	Phone Jack	
Power Amp. Output	2	"In"	Tip
Power Amp Common (or "Ground")	1		Sleeve
L.F. Transducer "+"	4	"Low Out"	Tip
L.F. Transducer "–"	3		Sleeve
H.F. Driver "T1" (red)	5	"High Out"	Tip
H.F. Driver "T2" (black)	6		Sleeve

NOTE: The high-frequency connections described above apply to most drivers, such as the E-V DH1506, in which a positive voltage input applied to "T1" results in a diaphragm movement toward the listener. In an inverted design, such as the E-V DH1012A driver, these connections must be reversed to maintain proper polarity. For other drivers, the appropriate data sheet should be consulted. If two drivers are employed, they must be connected in phase with each other.

The low-frequency speaker polarity may readily be checked, using a flashlight battery. When the positive battery terminal is momentarily connected to the "+" speaker terminal, cone motion will be in a direction toward the listener. In systems where more than one low-frequency speaker is employed, it is vital that they operate in phase with each other.

POWER CONSIDERATIONS

The XEQ 804 may be safely used on program material with any amplifier having a continuous sine wave (sometimes erroneously called "RMS") power rating of up to 400 watts into four ohms. Peak input voltage will be limited to less than ± 80 volts under these conditions. Two smaller amplifiers may be bridged to achieve this power, if desired. The crossover will handle a continuous 100-watt, shaped white noise input when measured in accordance with EIA Standard RS-426A.

EQUALIZATION

Figure 4 shows the XEQ 804 frequency response with a 4-ohm resistive load on the low channel, and 8-ohm on the high channel. Minor deviations can be expected when operating into actual transducer loads.

Low-Frequency Channel

A small amount of fixed equalization is provided in the low-frequency channel to counteract the usual rising speaker response on axis with frequency. This can result from directivity changes of the speaker system.

High-Frequency Channel

High channel equalization has been tailored to complement the E-V series of HR constant directivity horns. When used with an E-V DH1506 or DH1012A driver and TL606D and TL806D low-frequency speaker systems, an essentially flat acoustic frequency response is obtained with little or no additional system equalization. Equally good results can be obtained using an LF215 or a pair of LF118 low-frequency speaker systems, and the RC series of constant directivity horn/drivers. Adjustment of the horn driver level may be made by connecting two or more of the terminals numbered 6 through 11 together. Jumpers are provided for use between adjacent terminals, and a short length of 18-gauge, or heavier, wire may be used for longer jumpers. The XEQ 804 provides a great deal of flexibility in adjusting horn/driver level. The chart in Figure 5 gives a recommended starting point for jumper locations for various horn and driver types when using typical low-frequency speaker systems, as mentioned above. For example, connect terminals 6 and 7, and 7 and 10, when using an HR9040A horn.

Although the jumper connections in Figure 5 provide the flattest response in many systems, they may readily be changed to accommodate varying installations. Moving one column to the right increases the mid-range horn level by approximately 2 dB, and a 2-dB level decrease results from each column moved to the left. This allows the user to balance the system to meet his individual requirements. The right hand column (curve F) provides maximum level by sacrificing much of the equalization, and is intended for use only where additional frequency and/or level compensation is employed.

Using Two High-Frequency Horn/Drivers in Combination

It is possible to connect two horn/drivers at the same time to the XEQ 804, without affecting the crossover frequency.

When each driver is to be operated at the same level as the other, they may be connected directly in parallel. Total acoustic output from the pair will be similar to that of a single unit with the same jumper locations. Two dissimilar horn/drivers may also be driven at different levels. Because of the almost unlimited number of possible combinations, the user is referred to the schematic in Figure 6, which shows the values of available coupling capacitors. The sum of two or more capacitors may be obtained by connecting them in parallel by means of jumpers. For example, horn/driver No. 1 may be connected to terminals 5 and 6 or to the phone jack, with 6 and 7 jumpered (curve B, Figure 4). Horn/driver No. 2 may be connected to terminals 5 and 8, with 8 and 10 jumpered (curve C, Figure 4). Notice that the phone jack is available for connection only to horn/driver No. 1 in this case.

WARRANTY (Limited) –

Electro-Voice Professional Sound Reinforcement Electronic Products 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 cover finish or appearance items or malfunction due to abuse or operation at other than specified conditions. Repair by other than Electro-Voice or its authorized service agencies will void this guarantee.

For shipping address and instructions on return of Electro-Voice products for repair and locations of authorized service agencies, please write: Service Department, Electro-Voice, Inc., 600 Cecil Street, Buchanan, Michigan 49107 (Phone 616/695-6831) or 8234 Doe Avenue, Visalia, CA 93277 (209/625-1330,-1).

Electro-Voice also maintains complete facilities for non-warranty service.

Service and repair address for this product: Electro-Voice, Inc., 600 Cecil St., Buchanan, Michigan 49107.

Specifications subject to change without notice.

Part Number 530005–107

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