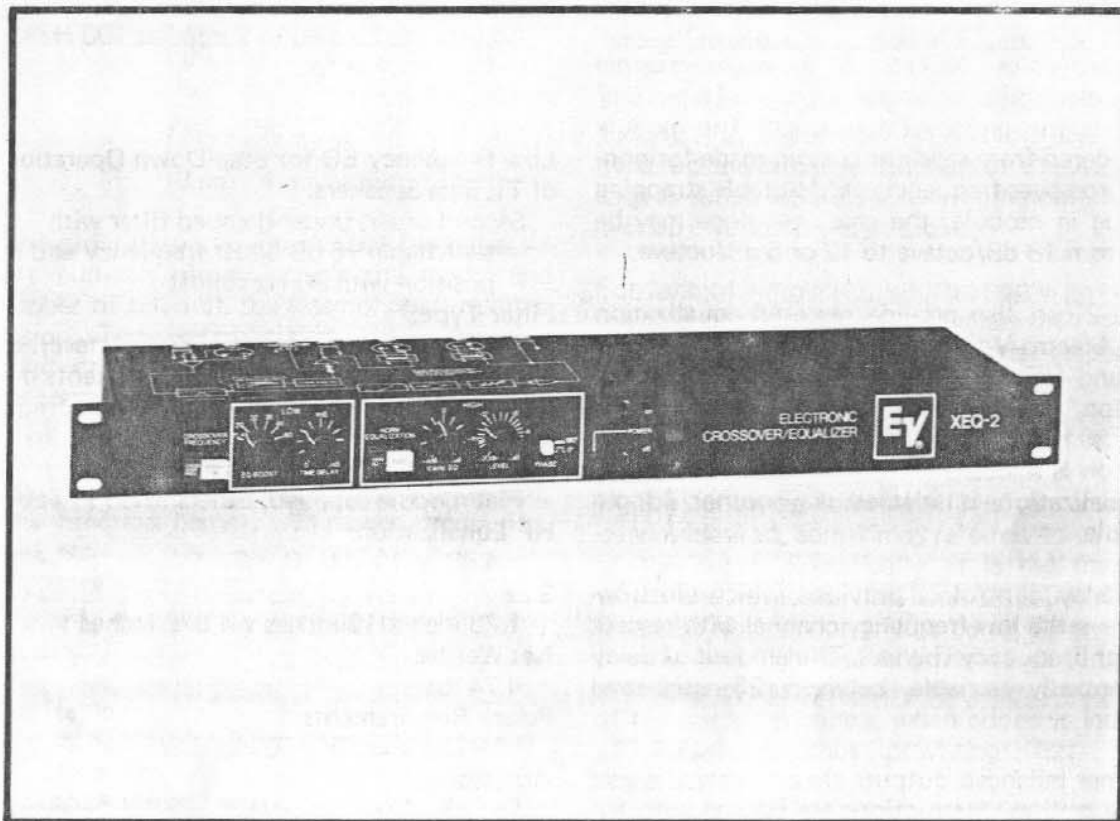


EV **Electro-Voice®**
XEQ-2
ELECTRONIC CROSSOVER

SERVICE MANUAL



XEQ-2
ELECTRONIC
CROSSOVER

XEQ-2 ELECTRONIC CROSSOVER

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XEQ-2 EQUALIZED ELECTRONIC CROSSOVER

1.0 GENERAL INFORMATION

The Electro-Voice XEQ-2 is a single channel equalized, electronic crossover. A plug-in 16 pin DIP module sets the crossover frequency. The module may be ordered from stock or custom made for non-standard crossover frequencies. By suitable strapping in the plug in module, the crossover slope may be changed from 18 dB/octave to 12 or 6 dB/octave.

The XEQ-2 can also provide required equalization for the Electro-Voice TL series low frequency systems and HR series Constant Directivity horns. In addition, a third-order (18 dB/oct.) subsonic rolloff at 30 Hz is provided. TL series low frequency equalization is selected with a rotary switch and HR series equalization is selected via another 16 pin DIP module.

A time delay control is provided which electronically delays the low-frequency channel with respect to the high frequency channel. The amount of delay is continuously variable between 25 usec and 2 msec.

Transformer balanced outputs are available as a user installable option. Instructions are packed with the transformer accessory (EV Model TRB-1).

1.1 SPECIFICATIONS

Type:

Equalized, electronic crossover

Frequency Response:

30-20 kHz, ± 0.5 dB, -3 dB at 30 Hz sum of outputs, controls flat

Noise Output:

-90 dB V maximum re 1 V, 20 kHz noise bandwidth

Total Harmonic Distortion:

0.02% typical, 0.1% max @ 20 kHz, ± 20 dBm

Overall Gain:

0 dB into high-Z load

Minimum Load Z:

600 ohms

Output Source Z:

47 ohms

Input Configuration:

Balanced or Unbalanced

Input Z:

30 k balanced bridging, 15 k unbalanced

Input CMR:

55 dB typical, 60-1 kHz

Connectors:

1/4 inch tip-ring-sleeve phone jacks and XLR-3 RCA for low frequency summing

Delay:

Adjustable, 25 usec to 2 msec at 100 Hz low frequency output

High Pass Filter:

-3 dB at 30 Hz, 12 dB/octave

Low Frequency EQ for Step-Down Operation of TL Bass Speakers:

Second order, under-damped filter with switchable $+6$ dB boost frequency and flat position with 30 Hz rolloff

Filter Type:

Third-order Butterworth (18 dB/octave). See Table 1. Other orders and alignments by custom construction, high and low frequency crossover points independently chosen

Plug-In Horn/Driver Equalization:

Flat module supplied, others listed in Table 1

HF Equalization:

± 4 dB at 10 kHz, $Q = 3$

Size:

1.73 inch x 19 inches x 4.875 inches

Net Weight:

4.74 lbs

Power Requirements:

90-120 V ac, 50-60 Hz, 8 W

Accessories:

Security Cover (supplied), TRB-1 balanced output transformers, BMK blank module kit

1.2 GENERAL SERVICING INFORMATION

Most Electro-Voice circuitry is built around commonly available IC operational amplifiers. A certain amount of familiarity with operational amplifier theory and operation will facilitate servicing this unit. Throughout this manual, the following convention will be used when discussing the various amplifier stages: U1 (1). This is to be interpreted as follows: Chip designation U1, output pin = 1.

The op-amp's output pin is particularly significant because all of the unit's stages are referenced to ground. Thus, the normal quiescent voltage at any op-amp output is 0 volts dc, give or take a few millivolts. Any op-amp output that is not at 0 volts dc is suspect, especially if it is at or near one of the power supply rails. Beware: much of the circuitry is direct coupled. It is important to look backward towards the input to localize the exact cause of trouble.

1.3 REPAIR PARTS

Service parts are available from the EV factory. Contact us by phone or mail.

Our address: Electro-Voice, Inc.
 600 Cecil Street
 Buchanan, MI 49107-0186

 (616) 695-6831
 (8 am - 4 pm eastern time zone)

If you are ordering parts and do not have the six digit part number, please include the model and serial number of the unit, the assembly part number and revision. The assembly part number/revision is a six digit, one letter code beginning with 800 that is rubber stamped on the parts side of the PCB assembly. In lieu of this information, the two digit, one letter code etched into the foil side of the PCB is helpful. If you are ordering a control or switch, tell us the function name . . . power, frequency, input level, etc.

In any event, be sure to include the following information:

Your Name
Shipping address (no post office boxes, please)
City, State, Zip
Daytime phone number
Method of shipment
(UPS ground if not specified)

If you call us for assistance on/with a problem, please have the EXACT model number, serial and assembly part numbers handy.

2.0 DISASSEMBLY INSTRUCTIONS

All circuitry is contained on one printed circuit assembly. Access the interior of the unit via the sheet metal screws securing the top cover.

2.1 Main Board Removal

- A. Remove top cover screws and top cover.
- B. Remove all pot knobs and control nuts underneath.
- C. Disconnect the red power transformer connector.
- D. Remove screws from main PCB.
- E. Slide board toward rear of chassis until pots clear front panel, lift up and out.
- F. Reverse this procedure to reassemble.

2.2 CUSTOM CROSSOVER FREQUENCY CALCULATION

The XEQ-2 has maximally flat third-order Butterworth filter characteristics when used with the supplied crossover frequency modules (800 Hz and 500 Hz). Other frequencies and characteristics are possible, with suitable choice of component values within the module. The component values for the "stock" modules are listed in Figure 2.3.

The module supplies the tuning resistors (RH1, 2, 3, and RL1, 2, 3) for the high and low pass filters that make up the crossover portion of the XEQ-2. Since each is tuned separately, any combination of slope, overlap or underlap is possible.

For sake of simplicity, information is given only for the case of the third-order Butterworth filters. This configuration gives a maximally flat response shape near the crossover frequency with 18 dB per octave slopes. This gives the best all around performance for the vast majority of applications.

In the following formulas, f_3 is the crossover frequency desired, sometimes referred to as the 'knee' of the curve. Specifically, it is the frequency at which the response has been attenuated by 3 dB from the flat portion of the curve. When the f_3 's of the low and high pass sections are made to coincide in frequency, as is usually the case, the total energy of the output channels, when added is independent of frequency, thus providing 'flat' frequency response.

Resistors RL1, RL2 and RL3 determine the filter characteristic of the low pass filter section. Similarly, RH1, RH2, and RH3 determine the high-pass section filter characteristics. One-quarter watt film resistors having a resistance tolerance of 1% or

EXE XEQ-2 ELECTRONIC CROSSOVER

2% are recommended. In less critical applications, 5% resistors may suffice. MIL type RN55D resistors are easiest to use, however, conformally coated resistors may also be used.

In the following formulas, R is given in ohms and f3 in Hertz. M stands for meg (as in megohm).

LOW PASS SECTION

$$\begin{aligned}RL1 &= 16.39 M / (f3+6) \\RL2 &= 116.97 M / (f3+6) \\RL3 &= 21.03 M / (f3+6)\end{aligned}$$

HIGH PASS SECTION

$$\begin{aligned}RH1 &= 24.32 M / f3 \\RH2 &= 9.55 M / f3 \\RH3 &= 167.3 M / (f3-7.6)\end{aligned}$$

After calculating the exact values, select the nearest standard value. For specialized applications (other slopes, and/or filter characteristics) consult the factory engineering department.

2.3 MODULE CONSTRUCTION

Construct the module as shown in Figure 2.3. If you use other than molded case resistors (MIL type RN55D) make sure that the leads are free from coating material where they emerge from the body of the resistor. Use a low wattage iron, preferably with a small chisel tip. Flush cutting diagonal cutters will make installing the module cover easier. Temporarily installing the module in a spare dip socket helps keep the pins in alignment during soldering. Remember the jumper from pin 2 to pin 15. When finished, glue the cover on using 'super glue' or other suitable adhesive.

2.4 SERVICE NOTE

Early XEQ-2 units may experience intermittent outputs, for no apparent reason. Typically, this is caused by low line voltage, particularly when the sound system is stressed (asked to deliver large outputs). The culprit is the anti-thump relay, K1, intermittently dropping out, at the trough of the AC line voltage.

To cure this problem, zener diode D7 was changed from a 15 V, 1N5245B to a 12 V, 1N5242B. This lowers the drop-out threshold of the anti-thump relay.

NOTES

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CROSSOVER MODULES									
DESCR	P/N	POS.1	POS.2	RL1 POS.3	RL2 POS.4	RL3 POS.5	RH2 POS.6	RH3 POS.7	RH1 POS.8
125HZ	801076	BLANK	JMPR	124K	887K	162K	76.8K	1.43M	196K
500HZ	801068	BLANK	JMPR	32.4K	232K	41.2K	19.1K	340K	48.7K
900HZ	801069	BLANK	JMPR	20.5K	147K	26.1K	11.8K	210K	30.1K
1.5KHZ	801077	BLANK	JMPR	11.0K	76.8K	14.0K	6.34K	113K	16.2K
3.5KHZ	801078	BLANK	JMPR	4.64K	33.2K	6.04K	2.74K	47.5K	6.98K
7.0KHZ	801079	BLANK	JMPR	2.32K	16.9K	3.01K	1.37K	23.7K	3.48K

EQUALIZER MODULES									
DESCR	P/N	POS.1	RE7 POS.2	RE4 POS.3	RE5 POS.4	RE6 POS.5	POS.6	RE1 POS.7	RE2 POS.8
HR-90	801071	BLANK	BLANK	68.1K	48.7K	4.75K	BLANK	56.2K	26.1K
HR-40 HR-60	801073	BLANK	BLANK	100K	48.7K	4.75K	BLANK	100K	22.1K
FLAT	801075	BLANK	JMPR	BLANK	BLANK	BLANK	BLANK	JMPR	BLANK
HR-4020A HR-9040A	801070	BLANK	BLANK	100K	39.2K	3.92K	BLANK	100K	48.7K
HR-120 3M-120	801072	BLANK	BLANK	100K	48.7K	4.75K	BLANK	68.1K	19.1K
HR-6040A	801074	BLANK	BLANK	100K	39.2K	3.92K	BLANK	147K	48.7K

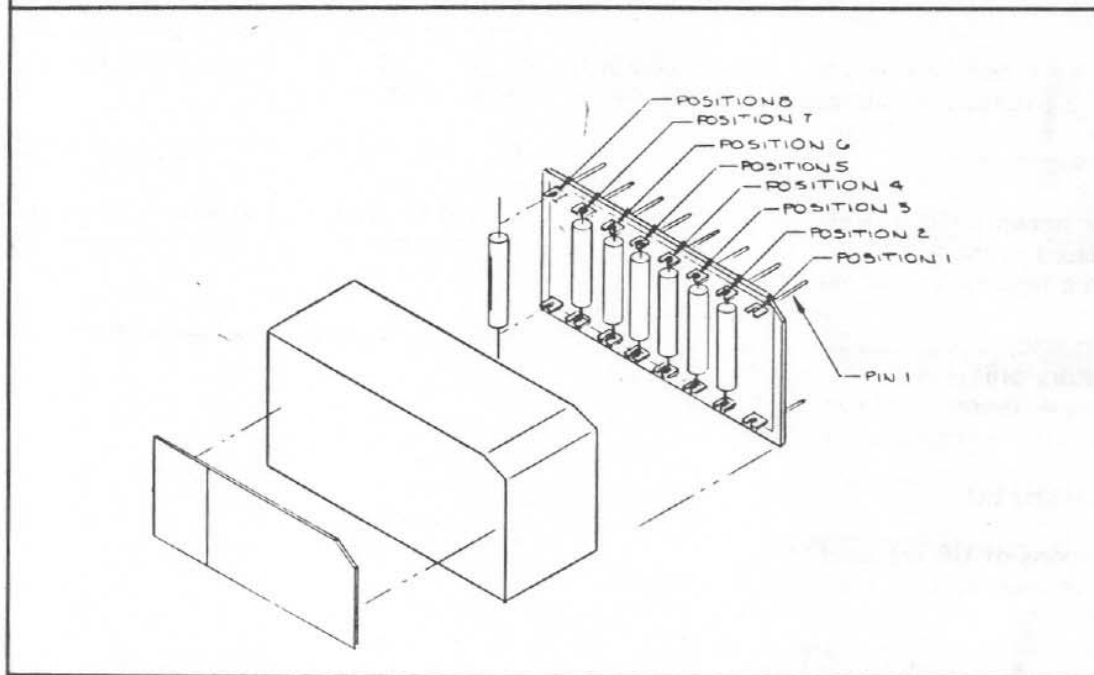


Figure 2-3

3.0 CIRCUIT DESCRIPTION

3.1 INPUT DIFFERENTIAL AMPLIFIER

Input signals (balanced or unbalanced) are applied to unit gain differential amplifier U1 (2). U1 (2) buffers the input signal and presents a low source impedance to the active crossover filters.

3.2 ACTIVE CROSSOVER FILTERS

Voltage follower U1 (7), C3, C4, C5, RH1, RH2, RH3 and R6 make up an active third order high pass filter. Resistors RH1, RH2 and RH3 control the corner frequency. Their values are computed as described in Section 2.2 of this manual. R6 ensures that U1 (7) has a ground reference in the event that a crossover module is not plugged in to the front panel socket.

Similarly, U2 (1), RL1, RL2, RL3, C15, C16, C17 make up an active third order low pass filter. RL1, RL2, and RL3 control the tuning.

3.3 HORN EQ

When a constant directivity horn is used with a conventional compression driver, equalization is necessary to restore flat frequency response. This is because of the falling high frequency response of the compression driver and the constant directivity horn's lack of high frequency beaming.

RE1, RE2, C6 and C7 make up a bridged tee notch filter. R10 ensures that U5 has a ground reference (through R8 and R9) if there is no equalization module plugged in.

A similar network (RE4, RE5, RE6, RE7, C8 and C9) is placed in the feedback loop of U5 (6)s. This results in a frequency response curve having a slight notch (caused by the C6/C7 network) followed by high frequency boost (C8/C9 network). Since all the resistors are plugged in via the equalization module, the overall curve may be optimized for many horn/driver combinations.

3.4 10 kHz EQ

Both sections of U6 are used to provide a limited amount of high frequency EQ centered around 10 kHz. This allows modification of the high frequency curve provided by U5 and associated components for variations in individual drivers and personal taste.

U6 (1) is a simulated inductor. C10 series resonates with the simulated inductance at approximately 10 kHz.

U6 (7) is the boost cut amplifier. When the wiper of the boost/cut pot R15 moves toward R14, the decreasing impedance of the series resonant circuit connected to R14's wiper causes a dip in the overall frequency response. When the wiper moves towards R17, the feedback is shunted away at resonance, causing a peak in the frequency response.

3.5 HF OUTPUT AMPLIFIER

U7 (7) is the high frequency output amplifier. It uses a NE5534 as either a unity gain inverter or as a voltage follower. C13 compensates U7 for unity gain. S1, the phase switch, determines which of the opamp's differential inputs the input signal is applied to.

3.6 LOW FREQUENCY EQ

U2 (1) is an active high pass filter. S2, the LF EQ switch, controls the cutoff frequency. In the FLAT position, U2 (1) becomes a second order (12 dB/oct.) Butterworth high pass filter. At other positions, U2 (1) becomes an underdamped high pass filter. In an underdamped second order filter, a peak occurs in the frequency response just before the curve breaks away from flat response. Once past the peak frequency, the curve falls at 12 dB/octave. The peak frequency is noted in the switch markings on the front panel. The peak amplitude is approximately 6 dB.

3.7 LOW FREQUENCY DELAY CIRCUIT

U3 and U4 make up an allpass filter. This has the characteristic of frequency independent constant time delay up to a frequency defined as $f = 1/t$, where t = delay time in seconds and f = frequency in Hz. The frequency response is flat.

U3 (7) is an inverting amplifier. Its input resistor is split in two to allow common bass mixing. By paralleling the junction of R35 and R36 with the identical point in another XEQ-2, the low frequency outputs are summed, for common (mono) bass applications.

The output of U3 (7) is fed to U4 (6), which is also the low frequency output stage. U4 (6) is connected as an active phase shifter, with R39 controlling the phase shift. Overall positive feedback is applied via voltage follower U3 (1) and the associated RC networks.

3.8 OUTPUT RELAY

Both low and high frequency output amplifiers feed K1, a DPST reed relay. K1 is delayed on at turn-on, but turns off instantly at turn-off.

K1 is powered from the raw dc power from the bridge rectifier. Darlington transistor Q1 operates as a switch to energize K1's coil. When power is applied, C41 charges through R56 until D7's zener voltage is reached. Q1 is turned on by the current through D7, closing the relay. On turn-off, C41 discharges quickly through D6 and the relay opens.

3.9 BALANCED OUTPUT TRANSFORMERS

When the balanced output accessory is installed, transformers T1 and T2 are connected to K1's outputs. They then feed the XLR output connectors. Both T1 and T2 are 1:1 ratio, 600 ohm transformers. The installation instructions are packed with the transformers.

3.10 POWER SUPPLY

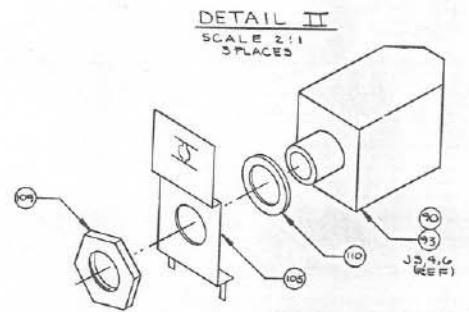
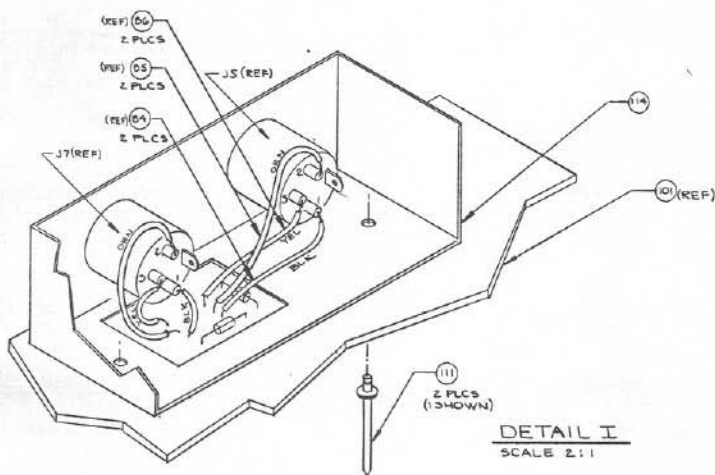
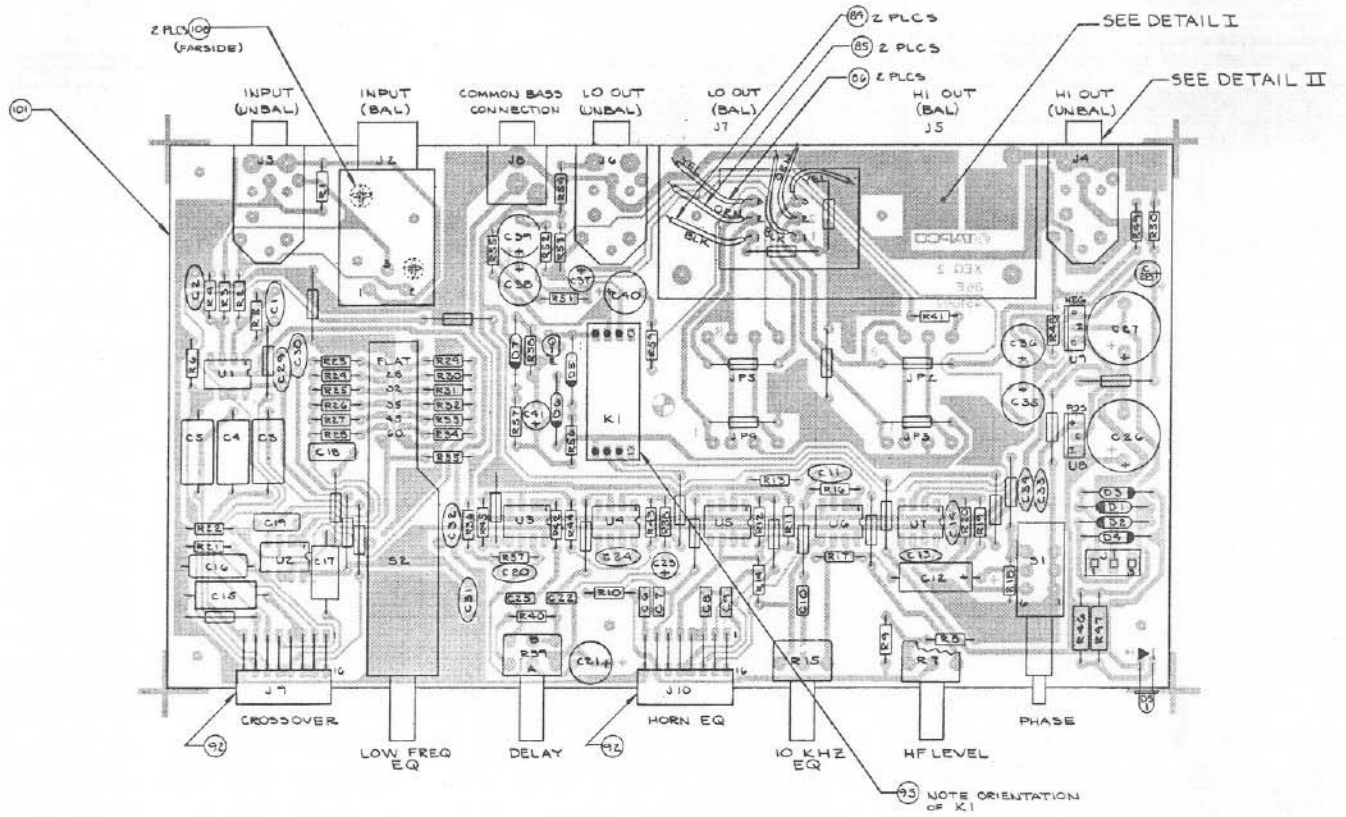
The XEQ-2 requires ± 15 volts dc for operation. This is supplied by a regulated supply consisting of a full wave rectifier and two three-terminal regulator ICs.

NOTES

XEQ-2 MISCELLANEOUS PARTS

Part Number	Description	Part Number	Description
804209	XFMR assy, export	007153	IC, volt reg, -15 V, 7915
804208	XFMR assy, domestic	007103	IC, volt reg, +15 V, 7815
804037	Linecord	007011	IC, single opamp, LF351
800132	PCB assy, XEQ-2	007010	IC, dual opamp, LF353
500704	Lckwshr, outside, CR, 7 mm	007009	IC, single opamp, NE5534N
500703	Washer, appearance, 7 mm	006021	Transistor, Darl, 2N6427
500702	Nut, hex, 7MMX 0.75 mm	005791	RES, MF, RN55D, 1.43M
500299	Screw, SM, SQSKTFH, 8X1/2	005790	RES, MF, RN55D, 887 k
500200	Screw, SM, blk PHP 8X1/2	005789	RES, MF, RN55D, 196 k
500112	Screw, SM, PHP, blk, 6X3/8	005788	RES, MF, RN55D, 162 k
500107	Screw, SM, PHP, blk 6X1/2	005787	RES, MF, RN55D, 124 k
500103	Screw, PHP, blk, 6-32X1/4	005786	RES, MF, RN55D, 113 k
500102	SCRU, blk, PHP, 6-32X3/8	005785	RES, MF, RN55D, 76.8 k
500070	SCRU, blk, PHP, 4-40X3/8	005784	RES, MF, RN55D, 47.5 k
500050	SCRU, PHP, blk, 4-40X3/16	005783	RES, MF, RN55D, 33.2 k
460181	Panel, Center, XEQ-2	005782	RES, MF, RN55D, 23.7 k
450238	Decal, crossover, 7 kHz	005781	RES, MF, RN55D, 16.9 k
450237	Decal, crossover, 3.5 kHz	005780	RES, MF, RN55D, 16.2 k
450236	Decal, crossover, 1.5 kHz	005779	RES, MF, RN55D, 14.0 k
450235	Decal, crossover, 125 Hz	005778	RES, MF, RN55D, 11.0 k
450234	Decal, crossover, blank	005777	RES, MF, RN55D, 6.98 k
450232	Decal, horn EQ, blank	005776	RES, MF, RN55D, 6.34 k
450231	Decal, EQ, flat	005775	RES, MF, RN55D, 6.04 k
450230	Decal, EQ, HR6040	005774	RES, MF, RN55D, 4.64 k
450229	Decal, EQ, HR40/HR60	005773	RES, MF, RN55D, 3.48 k
450228	Decal, EQ, SM120/HR120	005772	RES, MF, RN55D, 3.01 k
450227	Decal, EQ, HR90	005771	RES, MF, RN55D, 2.74 k
450226	Decal, EQ, HR4020/HR9040	005770	RES, MF, RN55D, 2.32 k
450225	Decal, crossover, 800 Hz	005769	RES, MF, RN55D, 1.37 k
450224	Decal, crossover, 500 Hz	005768	RES, MF, RN55D, 340 k
450208	Cover, XEQ-2, screened	005767	RES, MF, RN55D, 232 k
450207	Front panel, screened	005766	RES, MF, RN55D, 210 k
440138	End panel, painted	005765	RES, MF, RN55D, 147 k
440136	Chassis, XEQ-2 painted	005764	RES, MF, RN55D, 100 k
440134	Bracket, Power, XEQ-2	005763	RES, MF, RN55D, 68.1 k
440125	Plate, adapter, ac pwr	005762	RES, MF, RN55D, 56.2 k
400065	Knob, SM blk, w/line	005761	RES, MF, RN55D, 48.7 k
400064	Cover, security, XEQ-2	005760	RES, MF, RN55D, 41.2 k
400051	Knob, pushbutton, grey	005759	RES, MF, RN55D, 39.2 k
303308	Fuse, 32MA, slo blo Xprt	005758	RES, MF, RN55D, 32.4 k
303121	Fuse, 1/16 A, slo blo	005757	RES, MF, RN55D, 30.1 k
303120	Fuseholder, panel MT, dom	005756	RES, MF, RN55D, 26.1 k
303107	Carrier, fuse, export	005755	RES, MF, RN55D, 22.1 k
303103	Fuseholder, chass MT xprt	005754	RES, MF, RN55D, 20.5 k
303030	Rubber feet	005753	RES, MF, RN55D, 19.1 k
301025	Switch, RCKR, blk SPST	005752	RES, MF, RN55D, 11.8 k
300103	Cover, dip plug, .40 high	005751	RES, MF, RN55D, 4.75 k
300102	Dip plug, 16 pin	005750	RES, MF, RN55D, 3.92 k
300084	Receptacle, ac pwr	005456	POT, PCB, Vert 5 k LIN (B)
		005432	POT, Dual, vert PCB 2X50 k
		005420	POT, vert PCB 10 k LIN

EQ XEQ-2 ELECTRONIC CROSSOVER



FOR REFERENCE USE ONLY

Plug-In EQ Modules for XEQ-3 Electronic Crossover

Module	Used With										
	R1	R2	R3	R4	R5	R6	R7	R8	Drivers	Horns	
EQ "A"	---	---	68.1k	48.7k	4.75k	---	56.2k	26.1k	DH1012 & DH1506	HR90	
EQ "B"	---	---	100k	48.7k	4.75k	---	68.1k	19.1k	DH1012 & DH1506	HR120	
EQ "C"	---	---	100k	48.7k	4.75k	---	100k	22.1k	DH1012 & DH1506	HR40 & HR60	
EQ "D"	---	---	100k	39.2k	3.92k	---	100k	48.7k	DH1012 & DH1506	HR9040A & HR4020A	
EQ "E"	---	---	100k	39.2k	3.92k	---	147k	48.7k	DH1012 & DH1506	HR6040A	
EQ "F"	---	Short	---	---	---	---	Short	---	Flat Response	Flat Response	
EQ "G"	---	1.00M	100k	9.53k	.825k	---	140k	47.5k	DH2012	HR90	
EQ "H"	---	1.00M	100k	15.0k	2.32k	---	68.1k	30.1k	DH2012	HR120	
EQ "J"	---	1.00M	100k	22.1k	2.32k	---	100k	23.7k	DH2012	HR40 & HR60	
EQ "K"	---	1.00M	100k	7.50k	5.62k	---	110k	51.1k	DH2012	HR9040A & HR4020A	
EQ "L"	---	1.00M	100k	7.50k	5.62k	---	110k	51.1k	DH2012	HR6040A	
EQ "M"	---	---	140k	.392k	12.7k	---	158k	20.5k	DH1 & DH2	HP940	
EQ "N"	---	---	41.2k	8.45k	1.37k	---	169k	41.2k	DH1 & DH2	HP1240	
EQ "O"	---	---	Short	28.7k	2.00k	---	78.7k	78.7k	DH1 & DH2	HP420 & HP640	
EQ "P"	---	---	53.6k	41.2k	3.01k	---	53.6k	28.7k	DH1 & DH2	HP9040 & HP 4020	
EQ "Q"	---	---	41.2k	37.4k	4.75k	---	47.5k	41.2k	DH1 & DH2	HP6040	
EQ "R"	---	---	100k	16.9k	Short	---	107k	40.2k	DH1A, DH2A & N/Dym1	HP940	
EQ "S"	---	---	100k	3.57k	1.82k	---	107k	40.2k	DH1A, DH2A & N/Dym1	HP1240	
EQ "T"	---	---	84.5k	13.3k	1.43k	---	86.6k	66.5k	DH1A, DH2A & N/Dym1	HP640	
EQ "U"	---	---	35.7	14.3k	5.62k	---	14.7k	Short	DH1A, DH2A & N/Dym1	HP4020, HP6040 & HP9040	
EQ "V"	---	---	84.5k	13.3k	3.16k	---	86.6k	28.0k	DH1A, DH2A & N/Dym1	HP420	
EQ "W"	---	---	To be defined.								HP64, HP94, HP64S & HP94S
HP 16/32	73.2k	36.5k	---	---	---	---	75k	150k	Misc. LF Systems		
EB 29/35	205k	12.4k	---	---	---	---	15k	243k	Misc. LF Systems		
EB 45/60	113k	7.15k	---	---	---	---	9.58k	154k	Misc. LF Systems		
EQMT2 HF	---	1.00M	127k	12.7k	10.5k	---	86.6k	16.2k	MTH-2/64, MTH-2/94 & MTH-2/94A HF Section		
EQMT2 MB	---	---	53.6k	Short	Short	---	825k	274k	MTH-2/64, MTH-2/94 & MTH-2/94A MB Section		
EQMT2 LF	113k	15.0k	---	---	---	---	15.0k	113k	MTH-2 LF System		
MTX-4A HF	---	1.00M*	154k	14.0k	6.34k	---	80.6k*	7.87k	MTH-4A HF Section		
MTX-4A MF	---	1.00M*	127k	30.1k	3.65k	---	88.7k*	15.8k	MTH-4A MF Section		
MTX-4A MB	---	Short	---	---	---	---	Short	---	MTH-4A MB Section (Flat Response)		
MTX-4A LF	---	---	---	---	---	---	---	---	Not Applicable - Different EQ Topology Employed		
FS-212A HF	---	---	82.5k	14.3k	Short	---	84.5k	28.0k	FS-212A HF Section		
FS-212A LF	---	---	---	---	---	---	30.1k	60.4k	FS-212A LF Section (40 Hz HP)		
Stage Systems HF	---	---	95.3k	24.9k	1.00k	---	52.3k	24.9k	Stage System HF (DH3 or DH2010A on HT94)		
Stage Systems 12" LF	---	---	---	---	---	---	21.5k	43.4k	Stage Systems with 12" Woofers (55 Hz HP)		
Stage Systems 15" LF	---	---	---	---	---	---	30.1k	60.4k	Stage Systems with 15" Woofers (40 Hz HP)		

* Notes: MTX-4A HF & MF topology is slightly different --- Indicated values give equivalent results with XEQ-3 topology.
 MTX-4A LF topology is sufficiently different from the XEQ-3 that equivalent values don't exist. Use EQMT2 LF above.

EY XEQ-2 ELECTRONIC CROSSOVER

CROSSOVER MODULES									
DESCR	P/N	POS. 1	POS. 2	RL1 POS. 3	RL2 POS. 4	RL3 POS. 5	RH2 POS. 6	RH3 POS. 7	RH1 POS. 8
125HZ	801076	BLANK	JMPR	124K	887K	162K	76.8K	1.43M	196K
500HZ	801068	BLANK	JMPR	32.4K	232K	41.2K	19.1K	340K	48.7K
800HZ	801069	BLANK	JMPR	20.5K	147K	26.1K	11.8K	210K	30.1K
1.5KHZ	801077	BLANK	JMPR	11.0K	76.8K	14.0K	6.34K	113K	16.2K
3.5KHZ	801078	BLANK	JMPR	4.64K	33.2K	6.04K	2.74K	47.5K	6.98K
7.0KHZ	801079	BLANK	JMPR	2.32K	16.9K	3.01K	1.37K	23.7K	3.48K

EQUALIZER MODULES									
DESCR	P/N	POS. 1	RE7 POS. 2	RE4 POS. 3	RE5 POS. 4	RE6 POS. 5	POS. 6	RE1 POS. 7	RE2 POS. 8
HR-90	801071	BLANK	BLANK	68.1K	48.7K	4.75K	BLANK	56.2K	26.1K
HR-40 HR-60	801073	BLANK	BLANK	100K	48.7K	4.75K	BLANK	100K	22.1K
FLAT	801075	BLANK	JMPR	BLANK	BLANK	BLANK	BLANK	JMPR	BLANK
HR-4020A HR-9040A	801070	BLANK	BLANK	100K	39.2K	3.92K	BLANK	100K	48.7K
HR-120 SM-120	801072	BLANK	BLANK	100K	48.7K	4.75K	BLANK	68.1K	19.1K
HR-6040A	801074	BLANK	BLANK	100K	39.2K	3.92K	BLANK	147K	48.7K

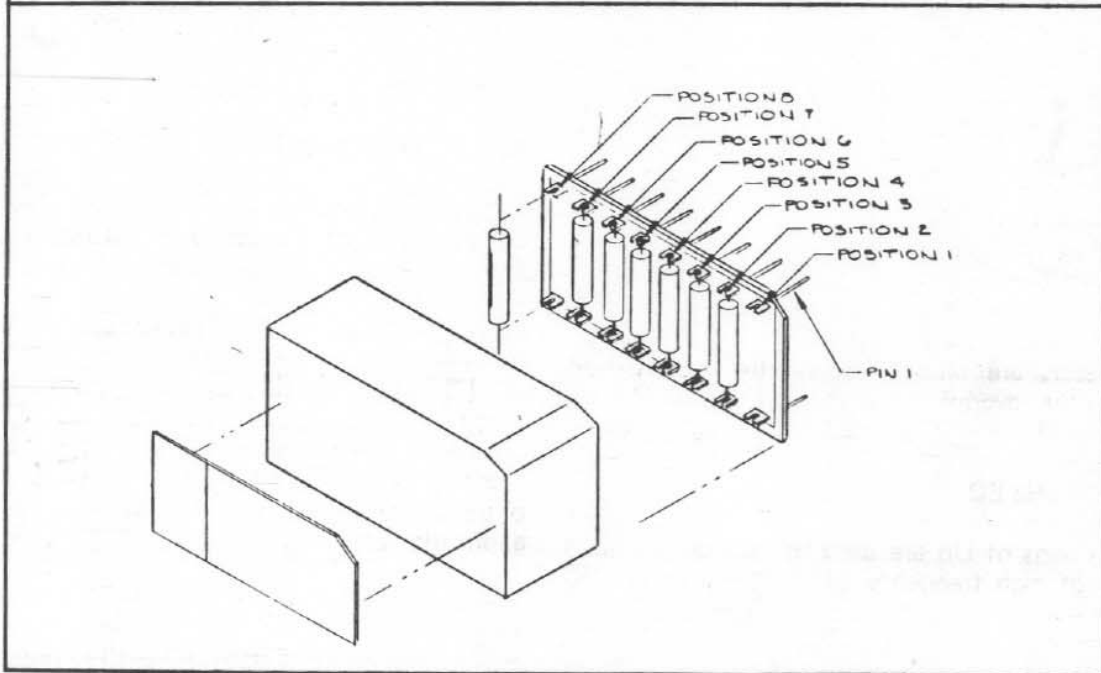


Figure 2-3