

McIntosh
MQ 104

OWNER'S MANUAL

McINTOSH MQ 104 CUSTOM ENVIRONMENTAL EQUALIZER



Your MQ 104 Custom Environmental Equalizer will give you many years of pleasant and satisfactory performance. If you have any questions concerning the operation or maintenance of this instrument, please contact:

CUSTOMER SERVICE

McIntosh Laboratory Inc.
2 Chambers Street
Binghamton, New York 13903
Phone: 607-723-3512

**WARNING: TO PREVENT FIRE OR SHOCK HAZARD,
DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.**

**Take Advantage of 3 years
of FREE Service . . .
Fill in the Application NOW.**

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THREE YEAR SERVICE CONTRACT

An application for a FREE THREE YEAR SERVICE CONTRACT is included with this manual.

The terms of the contract are:

1. McIntosh will provide all parts, materials and labor needed to return the measured performance of the instrument to the original performance limits free of any charge. The SERVICE CONTRACT does not cover any shipping costs to and from the authorized service agency or the factory.
2. Any McIntosh authorized service agency will repair all McIntosh instruments at normal service rates. To receive the free service under the terms of the SERVICE CONTRACT, the SERVICE CONTRACT CERTIFICATE must accompany the instrument when taken to the service agency.
3. Always have service done by a McIntosh authorized service agency. If the instrument is modified or damaged, as a result of unauthorized repair the SERVICE CONTRACT will be cancelled. Damage by improper use or mishandling is not covered by the SERVICE CONTRACT.
4. The SERVICE CONTRACT is issued to you as the original purchaser. To protect you from misrepresentation this contract cannot be transferred to a second owner.
5. For your protection McIntosh selects only dealers who have technical competence to guide purchasers fairly, and provide service when necessary. To receive the SERVICE CONTRACT your purchase must be made from a McIntosh franchised dealer.
6. Your completely filled in application for a SERVICE CONTRACT must be postmarked within 30 days of the date of purchase of the instrument.
7. To receive the SERVICE CONTRACT all information on the application must be filled in. The SERVICE CONTRACT will be issued when the completely filled in application is received at McIntosh Laboratory Incorporated in Binghamton, New York.

How to Connect

CONNECTING TO A PREAMPLIFIER/POWER AMPLIFIER SYSTEM

The MQ 104 is connected between the preamplifier and power amplifier. Connect shielded cables between the MAIN outputs of the preamplifier and the inputs on the MQ 104. Connect shielded cables from the outputs of the MQ 104 to the inputs of the power amplifier. The length of a connecting cable is limited by its electrical capacitance. The total capacity of each cable must not be more than 1000 pF. For instance: Cables with 25 pF per foot may be 40 feet long. The input impedance of the power amplifier should be 27,000 ohms or more.

When used with preamplifiers that have bass trim controls it is recommended that the bass trim controls be set in the flat position.

CONNECTING TO A RECEIVER WITH "PREAMP OUT/ POWER AMP IN" FACILITIES

Connect shielded cables between the preamplifier output jacks and the inputs on the MQ 104. Connect shielded cables between the outputs on the MQ 104 and the power amplifier inputs on the receiver.

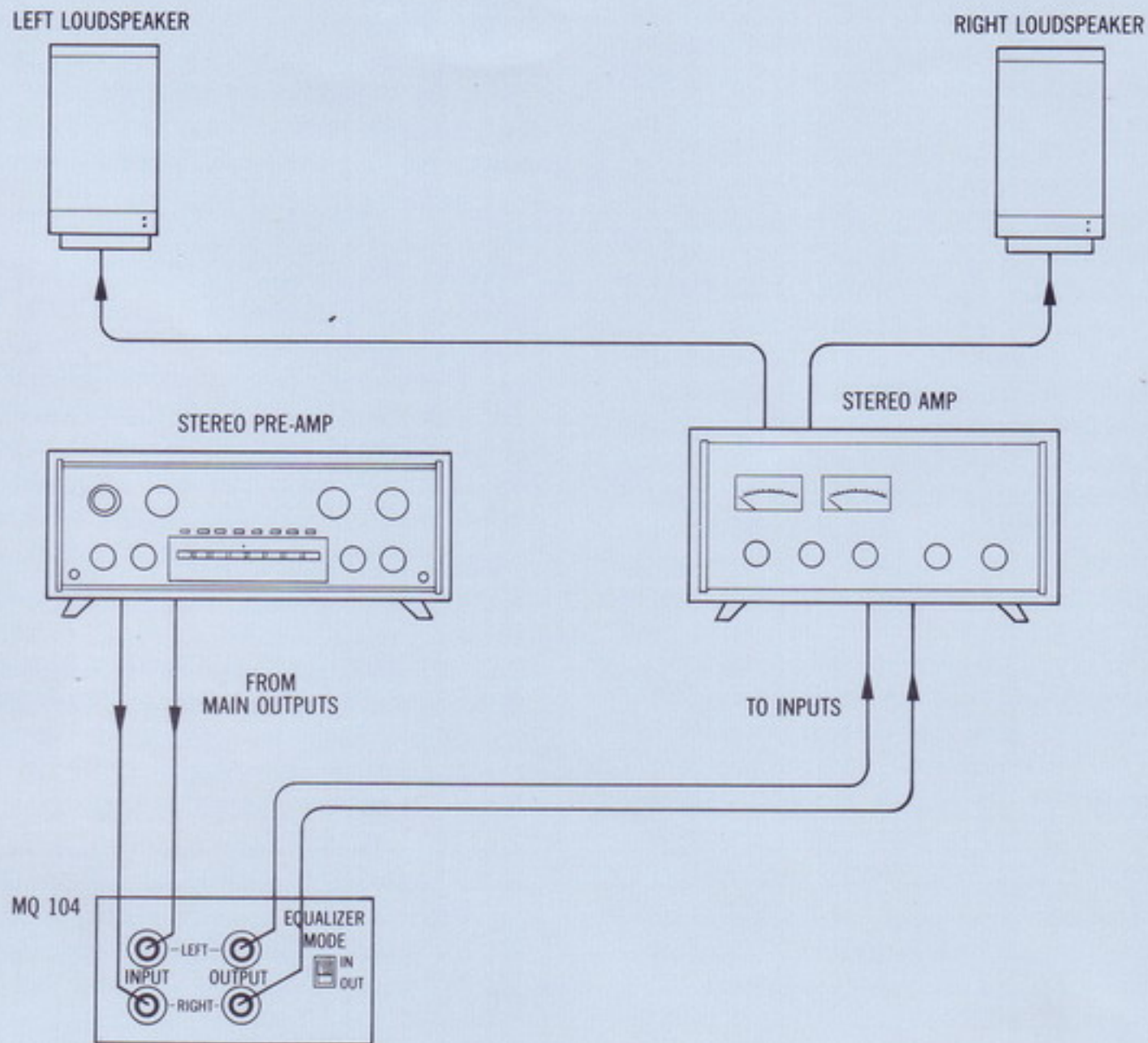
CONNECTING TO A RECEIVER USING TAPE MONITOR JACKS

Do not connect the MQ 104 using the tape monitor jacks. The high output levels may overdrive the MQ 104 causing distortion.

AC POWER

The power cord should be plugged into the switched AC power outlets of the preamplifier or receiver. The MQ 104 will then be turned on and off with the rest of the system.

How to Connect



Designing for Better Sound

McIntosh loudspeaker systems have a unique combination of moving or sound producing parts, cabinet, and acoustic damping material. The designed relationship of these many elements produces near perfect control of the woofer cone motion. Motional control is particularly important at system resonance where other types of designs lose control and cause "ringing." Control is accomplished at the expense of low frequency response which rolls off below 150 Hz. Low frequency compensation provided by the MQ 104 is used to restore and extend bass response to 20 Hz. Room gain effects also occur at low frequencies. Since compensation is necessary to restore low frequencies to the speaker system, compensation for different rooms can be combined at the same time. The design allows control for different room gains that occur when the speaker is placed on the floor in a corner, on the floor against a wall away from the corner, or off the floor against a wall away from the corner. The changes in low frequency output due to room gain are small and relatively uniform. The MQ 104 provides the same basic low frequency compensation as used in earlier McIntosh Environmental Equalizers. In addition, facilities are provided to correct room resonances.

Sound intensity changes described as room resonances occur due to reflections and counter reflections of the sound from wall to wall and between floor and ceiling. These resonances can cause serious peaks and dips below 250 Hz by as much as ± 15 dB. The sound that leaves the loud-

speaker may have smooth response, but a badly dimensioned room (equal or multiple dimensions) will seriously alter this response. Even a perfect loudspeaker will suffer.

The McIntosh MQ 104 has an additional set of filters designed specifically to equalize irregular low frequency response caused by room resonances. There are eight programmable filter bands (four in each channel) provided. Each filter can be programmed for frequency and bandwidth. Each filter is adjustable for amplitude boost or cut.

Extensive testing of home living rooms and dealer listening rooms indicate that room dimensions influence the performance of loudspeakers below 1000 Hz. The most pronounced effects are measured below 250 Hz. Speakers which appear to have no highs and sound "boomy" usually are the victims of a poor listening environment. By eliminating the low frequency peaks caused by standing waves, the highs will appear to be restored and the "boomy" sound will be gone. In many "problem" rooms, the difference with and without the MQ 104 is literally night and day.

The MQ 104 is designed to be used with accurate acoustic test equipment. Response measurements in the normal listening area are essential to correct equalization with the MQ 104. In addition, the MQ 104 can be most effectively adjusted by persons having knowledge and expertise in making acoustic measurements. Do not attempt to change control settings or filters of the MQ 104 by listening to music or test records.

With suitable test equipment and qualified personnel, the McIntosh MQ 104 allows complete control of the listening room environment at low frequencies. Not only can the MQ 104 restore the low frequency response of McIntosh speakers and compensate for room gain, but it will also equalize for reflected sound in the room.

Performance Limits

PERFORMANCE GUARANTEE

Performance Limits are the maximum deviation from perfection permitted for a McIntosh instrument. We promise you that the MQ 104 you buy must be capable of performance at or exceeding these limits or you get your money back. McIntosh is the only manufacturer that makes this guarantee.

FREQUENCY RESPONSE

± 0.5 dB from 20 Hz to 20,000 Hz (with equalization set flat)

HUM AND NOISE

Flat Response, 90 dB (79 μ V) below rated output (2.5 V)
Worst case setting, 85 dB (140 μ V) below rated output (2.5 V)

HARMONIC AND INTERMODULATION DISTORTION

Will not exceed 0.1% at rated output level (2.5 V) 20 Hz to 20,000 Hz

LOW FREQUENCY COMPENSATION

Five steps of low frequency compensation are included for McIntosh speakers, allowing 0 to +17 dB at 20 Hz

INPUT SENSITIVITY AND IMPEDANCE

2.5 volts into 27,000 ohms for rated output with controls set for flat response

OUTPUT LEVEL AND IMPEDANCE

2.5 volts into 27,000 ohms or more with controls set for flat response. Output source impedance is 600 ohms.

PROGRAMMABLE FILTERS

8 sections (4 per channel) each of which can be programmed for 1/3 octave center frequencies from 20 Hz to 1000 Hz. Filter bandwidth is programmable for narrow (approx. 1/3 octave) or wide (approx. 1 octave). Amplitude is continuously adjustable ± 12 dB for narrow and ± 15 dB for wide. A detented control is used to position for flat response. Programming is achieved by means of plug-in capacitors provided with the MQ 104.

MECHANICAL INFORMATION

SIZE

Measures overall: length 9 $\frac{1}{4}$ inches (23.5 cm) by width 5 $\frac{1}{2}$ inches (14.0 cm) by height 3 $\frac{3}{8}$ inches (9.2 cm)

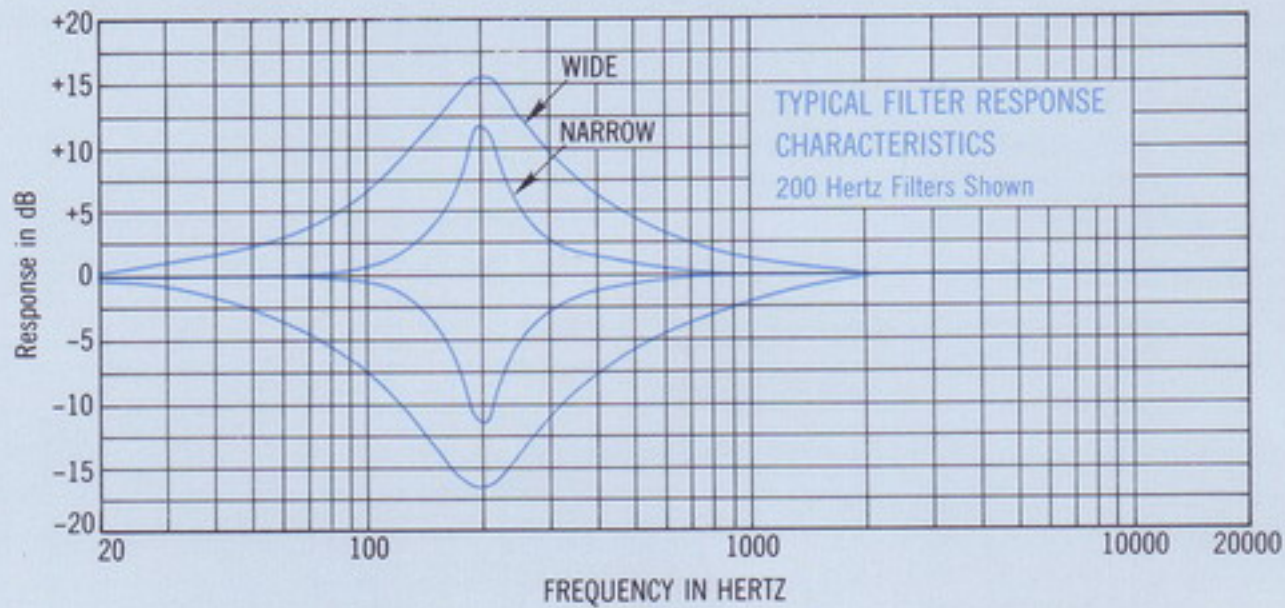
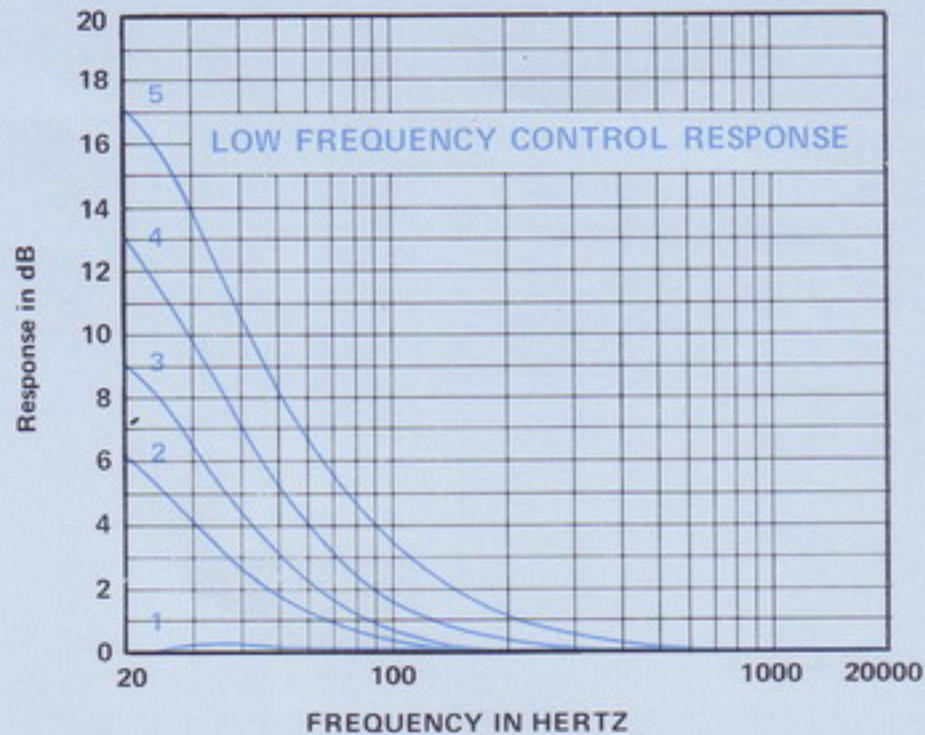
FINISH

Chrome and Black

WEIGHT

4 $\frac{3}{4}$ pounds (2.15 kg) net, 6 $\frac{1}{4}$ pounds (2.83 kg) in shipping carton

Performance Charts



Using the MQ 104

LOW FREQUENCY COMPENSATION

When room resonances are not a problem the compensation controls are used in the normal way. A McIntosh speaker system which is located against the wall, off the floor and away from the corners of the room, requires the low frequency compensation switch to be set to position 5. A McIntosh speaker system, located against the wall on the floor away from the corner, uses position 4. When the speaker is located on the floor in the corner, use position 3.

Where room resonances are a problem, each channel setting might have to be different depending on the measurements made in the listening area.

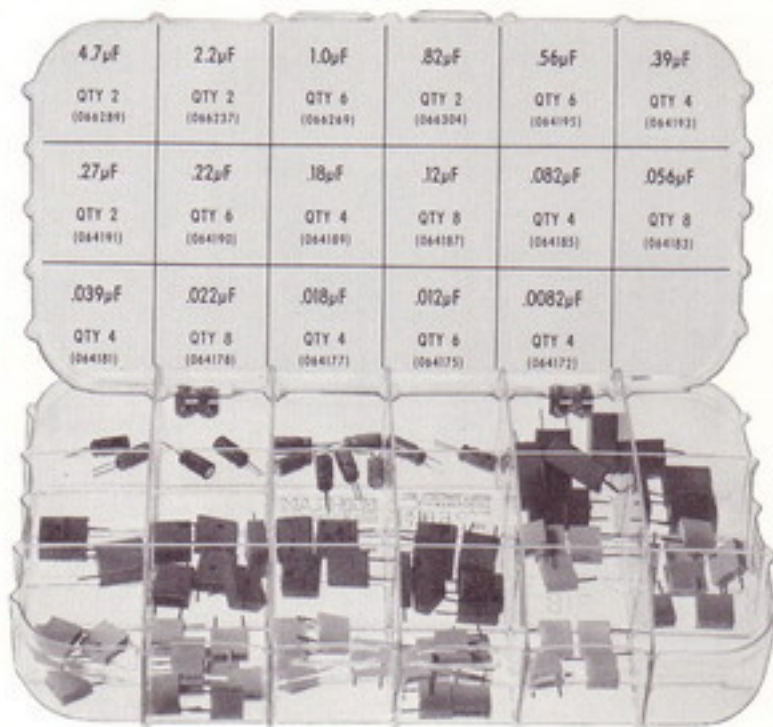
PROGRAMMABLE FILTERS

Each filter section can be identified by a number, a detented control, and two capacitor plug-in locations, A and B. When the control is set at the detented position, the filter is electrically flat. When the desired capacitors are inserted and the control is turned clockwise, the filter boosts. When the control is turned counterclockwise, the filter cuts.

Capacitors A and B program the frequency and bandwidth of the filter. Capacitor values are found by using the frequency programming table on page 8. If no capacitors are inserted in the filter section, turning the control will have no effect. Both capacitors must be inserted in the section used for proper operation. It is not necessary to observe the polarity of the electrolytic capacitors.

EQUALIZER MODE SWITCH

When the switch is in the OUT position, the programmable filters are completely by-passed. When the switch is at the IN position, the programmable filters operate in their intended fashion. When switching the equalizer mode IN and OUT for comparison purposes, less volume may be noticed at the IN position. Less volume will be evident when several filters have been used in the cut mode for large amounts of attenuation. The "loss" in volume is the result of reducing or eliminating excessive bass peaks caused by room resonances.



MQ 104 CAPACITOR KIT

Frequency Programming Table

FREQUENCY (Hz)	NARROW FILTER		WIDE FILTER	
	(CAPACITOR A)	(CAPACITOR B)	(CAPACITOR A)	(CAPACITOR B)
20	1.0	.39		
25	1.0	.27	4.7	.056
31.5	.82	.22		
40	.56	.18		
50	.56	.12	2.2	.022
63	.39	.12		
80	.22	.12		
100	.22	.082	1.0	.0082
125	.18	.056		
160	.12	.056		
200	.12	.039	.56	.0082
250	.12	.022		
315	.082	.022		
400	.056	.018		
500	.056	.012		
630	.039	.012		
800	.022	.012		
1000	.022	.0082		

Note: All capacitor values are shown in microfarads.

The capacitors are selected for each frequency using the Frequency Programming Table. Capacitors are used in combinations from the capacitor kit supplied with the MQ 104. It is not necessary to observe the polarity of the electrolytic capacitors. Additional frequencies can be used by calculating new capacitor values. The formula for these calculations is:

Additional capacitors are available from your radio parts dealer. Please note that "stock" values are normally the only ones available. If, for example, you calculate a capacitor value of .095 mfd, the closest value available will be .1 mfd. Preferred capacitors are metalized polyester or equivalent and are to have a voltage rating of 50 V or higher.

CAPACITOR	NARROW FILTER	WIDE FILTER
Capacitor A in Microfarads	$\frac{23.5}{\text{Frequency (Hz)}}$	$\frac{118}{\text{Frequency (Hz)}}$
Capacitor B in Microfarads	$\frac{7.2}{\text{Frequency (Hz)}}$	$\frac{1.44}{\text{Frequency (Hz)}}$

Capacitor Insertion

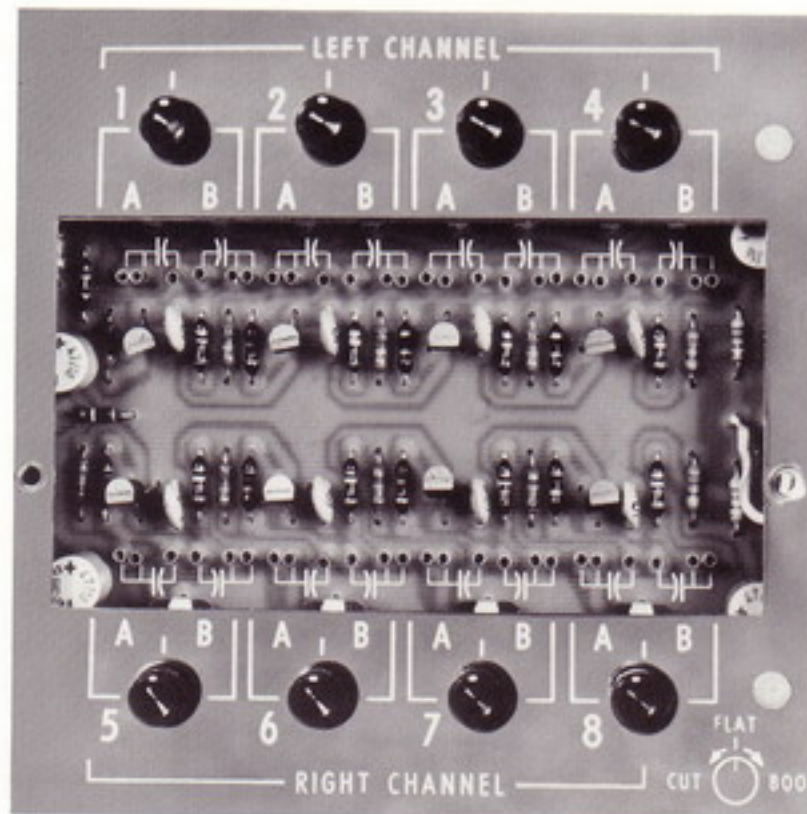
Three holes are available for each capacitor. Only two holes are actually used depending on the lead spacing of the capacitors.

Suppose you select the narrow filter at 31.5 Hz as your first band of equalization in the left channel. Insert a .82 mfd capacitor in the A position of the filter section 1 on the board. Insert a .22 mfd capacitor in the B portion of the same filter section. For correct performance both capacitors must be inserted. They must also be placed in the same filter section.

In the same way capacitors for the second filter are then inserted for the second frequency you wish to equalize, etc.

Having selected both filter width and frequency, the final adjustment is for amplitude. Each filter section has a detented control. Response is flat in the detented position. Response in the filtered band increases by turning the control clockwise and decreases by turning counterclockwise. As the control is turned further from the center or detented position, the filter skirts may overlap adjacent bands. This will affect the amplitude of adjacent bands which must then be readjusted.

It will be helpful to record the filter frequencies, capacitor values, and control settings on the card provided. Insert this card in the cover of the MQ 104.



Technical Description

The MQ 104 Custom Environmental Equalizer is an active equalizer which provides low frequency compensation and eight programmable filter bands (four for each channel). Each filter can be programmed for frequency and bandwidth and is adjustable for amplitude boost or cut. Programming is accomplished using plug-in capacitors furnished with the MQ 104.

Each channel of the MQ 104 uses two wide bandwidth integrated circuit operational amplifiers. The amplifiers are arranged to have unity gain when the MQ 104 is adjusted for flat frequency response. Frequency response shaping is accomplished by a combination of passive filtering and active negative feedback filtering techniques.

The signal first enters a passive low frequency compensation network that has 17 dB of attenuation at mid and high frequencies and adjustable low frequency response. The signal then enters the active high pass filter. The input amplifier stage follows which has 17 dB gain to make up the loss in the low frequency compensation network. This amplifier makes possible two active filter circuits. The first is feedback to the high pass filter that rolls off the response very sharply below 20 Hz. The second is a low frequency feedback network that operates together with the passive input compensation network.

The signal next goes to the four programmable filters and then to the filter amplifier. This amplifier has a gain of unity but its input and feedback circuits go to four po-

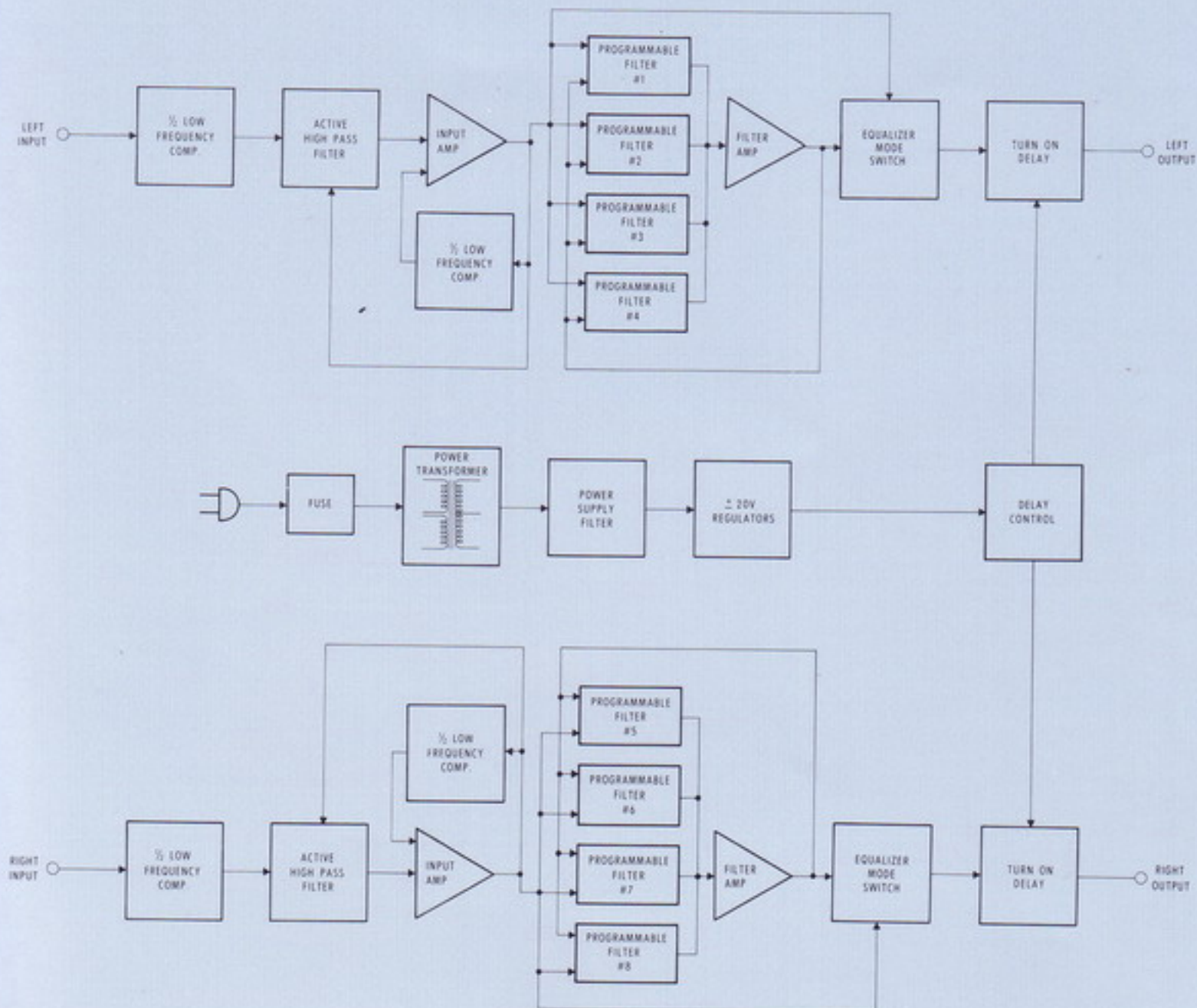
tentiometers which connect to the filters. When a potentiometer is turned clockwise the associated filter causes the amount of negative feedback used around the amplifier to reduce at the resonant frequency of the filter. Thus an increase in response is produced at the filter frequency. In a similar fashion, if the potentiometer is rotated fully counterclockwise the filter will reduce the signal applied to the amplifier input and attenuation is produced at the filter frequency.

The programmable filters each consist of a simple series resonant circuit. The series capacitance element is one of the programming capacitors. The series inductance element is a simulated inductor. The simulated inductor is an active circuit using a darlington transistor, the second programming capacitor, and several resistors. The circuit values have been selected to produce the desired limit for boost or cut. The value of the programming capacitors determine the filter frequency and bandwidth.

The output signal from the filter amplifier goes through the mode switch and turn on delay to the output terminals on the MQ 104.

There are several other circuit features worthy of mention. The power supply is dual voltage and zener diode regulated. The turn on delay control operates to delay the output signal from the MQ 104 for several seconds after turn on to eliminate turn on transients. A mode switch is provided so the programmable filters can be switched into or out of the circuit for comparison purposes. Thorough RF shielding and filtering is used on both input and output circuits to prevent pickup from strong RF fields like nearby broadcast or CB stations.

Block Diagram



McIntosh

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