McIntosh

TUNER PREAMPLIFIER MX110

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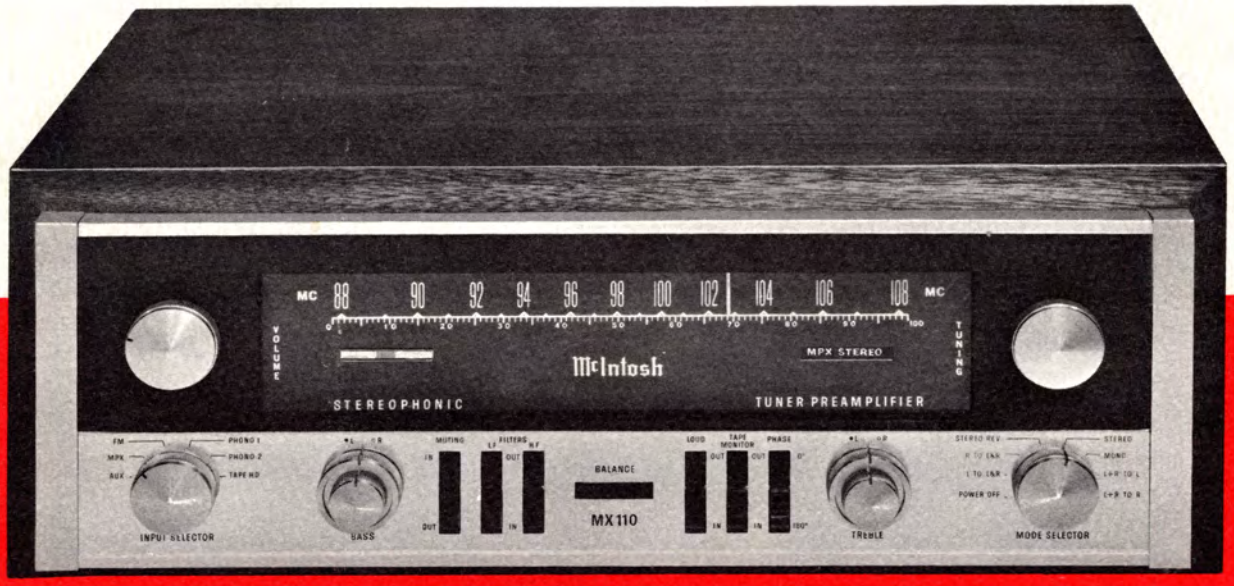


OWNER'S MANUAL

ISSUE NO. 1

Reading Time 45 Minutes

MX110 TUNER PREAMPLIFIER

GENERAL DESCRIPTION

The MX110 combines in one unit an extremely low-distortion preamplifier with a highly sensitive FM multiplex stereo tuner. Every desirable feature of a tuner and a preamplifier is included in this design. Interstation noise suppression, tuning indicator, FM multiplex indicator, separate bass and treble controls, electronic phase switch, and a new type of lateral balance control have all been engineered into the MX110. The INPUT SELECTOR gives a choice of six different program sources. The MODE SELECTOR is a newly developed control which makes it very easy to balance a stereo system, to add left to right for monophonic operation, to control the left to right stereo perspective or to compare the left and right channels of a stereo program. The MX110 is also turned off and on by the MODE SELECTOR. The loudness level of the phono channels and auxiliary channel may be balanced to the tuner loudness level by adjusting controls located at the side of the front panel under the end caps. There are three controls on the left and three on the right.

The McIntosh MX110 is a beautifully engineered control center for the finest stereo sound systems. The extreme care in manufacturing, in layout design and in thermal engineering promises the usual McIntosh extra values of reliability, performance, and long life.

TECHNICAL DESCRIPTION

The radio-frequency amplifier of the MX110 is a "cascode" type circuit. The circuit is specially designed to amplify weak signals with less noise and distortion. By tuning this amplifier, and controlling other circuit constants, spurious response rejection is improved. The high-frequency oscillator mechanical layout is engineered for minimum response to temperature variations. In fact the combination of mechanical and electronic design is so unusually good in this circuit that automatic frequency control is not needed in the MX110. The mixer output is amplified by three flat-topped intermediate frequency amplifiers. The transformers used in the I.F. amplifiers are designed for maximum adjacent channel rejection, for electrical stability, and for electrical and mechanical resistance to shock and vibration.

The R.F. and I.F. circuits of the MX110 are completely shielded and exceed the FCC requirements for suppression of oscillator radiation. Either a 300 ohm or 75 ohm antenna may be used with the MX110. A VHF television antenna which is suitable for FM reception can be connected to the MX110.

In the MX110, a new type of mechanical tuning assembly gives smooth flywheel tuning. By controlling the relations between mass and mechanical resistance, and dividing work loads in the dial drive system, it becomes nearly impossible to detect any backlash. Yet the entire dial drive is a model of mechanical stability. For smooth, quiet action and extended life with virtually no wear, a teflon lined pointer carriage and nylon pulleys are used in the dial cord assembly.

MULTIPLEX DECODER

The multiplex decoder uses a special McIntosh developed detecting circuit. One of the advantages of this circuit is the elimination of the critical adjustments necessary with commonly used matrixing methods. This circuit detects the L-R sidebands and automatically matrixes the recovered information with the L+R main carrier signal. This circuit then yields L and R with maximum separation.

A temperature stabilized 19KC amplifier locks-in a highly stable push-pull synchronous oscillator. Apart from other advantages, this method provides greatest noise immunity. Balanced detectors cancel 19KC and 38KC components in the output and insure low distortion.

A three-section sharp cut-off filter rejects SCA interference and reduces susceptibility to spurious signals.

The MX110 has an MPX stereo indicator that lights when the dial pointer crosses a station broadcasting MPX stereo. A unique circuit using a transistor operates the MPX stereo indicator. The transistor is controlled by a differential detecting circuit that amplifies the 19KC pilot signal. This circuit automatically discriminates between the 19KC signal and noise.

AUDIO

The MX110 audio amplifier consists of three negative-feedback amplifying sections in duplicate for the left and right stereo channels and a separate L+R monophonic amplifier. The first section in each channel is a feedback preamplifier used to amplify and compensate for the input signals coming from phonograph pickups or tape heads. Level set controls are connected into the output circuit of this preamplifier section when the INPUT SELECTOR is switched to PHONO 1 or PHONO 2. These controls may be used to maintain uniform loudness between phono and tuner inputs. Skillful layout, grounding, and shielding for low-hum pickup, metal film resistors, low-noise tubes and extreme care in manufacturing combine to reduce noise and hum in the input amplifiers.

The second amplifier section in each channel is a cathode follower. The sharp cut-off (18db per octave) rumble and high-frequency filters are associated with this section. Input-level set controls for the auxiliary inputs are associated with this section. All the level set controls are conveniently accessible at each side of the front panel under the end caps.

The third amplifier section is a two stage negative feedback amplifier. The variable bass and treble controls are included in the feedback loop to maintain the lowest possible distortion. For example a wave meter analysis of the three amplifier sections of the MX110 shows less than 1/10 of 1% distortion at 3 volts output. The MODE SELECTOR, balance controls and left and right outputs are associated with the third amplifier section.

The L+R monophonic amplifying section is a feedback summing amplifier. It supplies monophonic output as well as L+R output.

POWER SUPPLY

The power supply of the MX110 has received very special design attention. Three separate rectifier circuits are used.

First, a full-wave rectifier supplies D.C. to the heaters of all audio stages.

A second bridge rectifier supplies D.C. to the anodes of the audio stages.

Then a third full-wave rectifier supplies D.C. to the tuner stages.

This elaborate power supply design insures the lowest possible background hum level and also the maximum stability. In addition to this careful work the power transformer uses special magnetic shielding to minimize hum pickup in the MX110 as well as in any other equipment associated with it.

MECHANICAL SPECIFICATIONS

Dimensions
Chassis: 15½ inches wide; 5⅛ inches high; 12⅞ inches deep including connectors.
Front Panel: 16½ inches wide; 5½ inches high
Front Panel Mounting Space Required: 16⅜ inches wide; 5⅜ inches high
Knob Clearance: 1½ inches

Weight
Chassis: 20 pounds
Shipping Weight: 30 pounds

Finish
Anodized gold and black (front panel)

TUNER SPECIFICATIONS

Sensitivity
Better than 2.5 microvolts at 100% modulation

R.F. Amplifier
Cascode

I.F. Amplifiers
Three

Limiters
Two

I.F. Bandwidth
200KC flat top

I.F. Transformers
Mechanically captive

Muting
I.F. injected. Both the Muting and the Tuning Indicator are fed from a sharply tuned circuit that is independent of the normal listening circuits.

Tuning Indicator
Tuning is indicated by an electron ray tube. (See above.)

Frequency Response
Within ±1db 20 to 20,000 cycles. (Including 75 microseconds deemphasis.)

Hum
Greater than 70db below 100% mod. (Audio tubes have D.C. on the filaments.)

Drift
Less than 25 KC

Ant. Input Impedance
300 balanced, 72 ohms unbalanced

Radiation
Substantially below F.C.C. requirements.

Distortion
Less than 0.6% distortion at 100% modulation, ±75KC deviation above 2.5 microvolts at antenna.

MULTIPLEX DECODER SPECIFICATIONS

MPX Decoder
Hum Level: Better than 60db below 100% stereo modulation.
Distortion: Less than 0.3% (Multiplex Unit only).
Suppression of Pilot (19KC) and Carrier (38KC): Greater than 40db below 100% modulation.
Front Panel Stereo Indicator Light: Activated by 19KC carrier only.

AUDIO SPECIFICATIONS

Inputs
Total 5 each channel:
AUX.;
PHONO 1 MAG. or XTAL;
PHONO 2 MAG.;
TAPE HEAD;
TAPE MONITOR.

Outputs
2 Main Stereo Outputs, 1 Tape Stereo Output, and 1 L+R Output

AC Aux Outlets
1 unswitched and 2 switched

Controls
Input Selector: Total 6 positions: AUX, MPX, FM, PHONO 1, PHONO 2, TAPE HEADS.
Mode Selector: Total 8 positions: POWER OFF, L TO L&R, R TO L&R, STEREO REV., STEREO, MONO, L+R TO L, L+R TO R.
Tone: Dual treble and bass negative-feedback controls with slip clutch for independent adjustment of each channel. Bass Boost: 15db at 50 cycles. Bass Cut: 18db at 50 cycles. Treble Boost: 15db at 10,000 cycles. Treble Cut: 15db at 10,000 cycles.
Balance: Turn to right to emphasize the right channel. Turn to the left to emphasize the left channel.
Phase: 2 positions: NORMAL or REVERSED phase in left channel. Does not increase distortion.
H.F. Cutoff Filter: 2 positions: Flat, or 5KC cutoff. (20db per octave.)
L.F. Cutoff Filter: 2 positions: Flat, or 50 cycles cutoff. (20db per octave.)
Loudness: Fletcher Munson compensation.
Tape Compare: 2 positions: For instantaneous comparison of tape before and after recording.
Tuning: Fly wheel tuning—no backlash.
Muting: 2 positions: IN or OUT for interstation noise suppression.
Level Set: Three left-hand and three right-hand controls that are located under the end caps. 2 each for AUX, PHONO 1 and PHONO 2.

ELECTRICAL SPECIFICATIONS

Frequency Response
±½db 20 to 20,000 cycles

Distortion
Less than .2% at rated output.

Hum and Noise
High-level inputs: 80db below rated output.
Low-level inputs: less than 3 microvolts at input terminals.

Input Sensitivity
AUX: 0.3 volt at 200K
PHONO 1: 3 millivolts at 47K
PHONO 2: 3 millivolts at 47K
TAPE HEAD: 5 millivolts at 220K
TAPE MONITOR: 0.3 volt at 100K

Outputs
MAIN: 3 volts 2 in parallel each channel
L+R: 3 volts
TAPE: 0.3 volt

TUBE COMPLEMENT

1	6AB4	Osc.
1	12AT7	Mixer
1	6BN4A	RF
1	6AU6	1st IF
1	6AU6	2nd IF
1	6AU6	3rd IF and 1st Lim.
1	6CS6	2nd Lim.
2	12AX7	L and R Phono Preamps
1	12AX7	L and R 1st AF
3	6U8	L and R 2nd AF, MPX Amp.
1	12AT7	Muting and L+R Amp.
1	12AU7	MPX Push Pull Oscillator
1	EM84A	Tuning Indicator
2	Diodes	Discriminator
1	Diode	Muting and Tuning Eye Det.
1	Diode	AGC Clamp
4	Diodes	Balanced MPX Detectors
2	Diodes	Balanced Det. for Indicator Light
2	Silicon Diodes	DC Filament Supply
1	MA113	Transistor-Indicator Light Switch
4	Selenium Rectifiers	High and Low Voltage Supply

FRONT PANEL FACILITIES

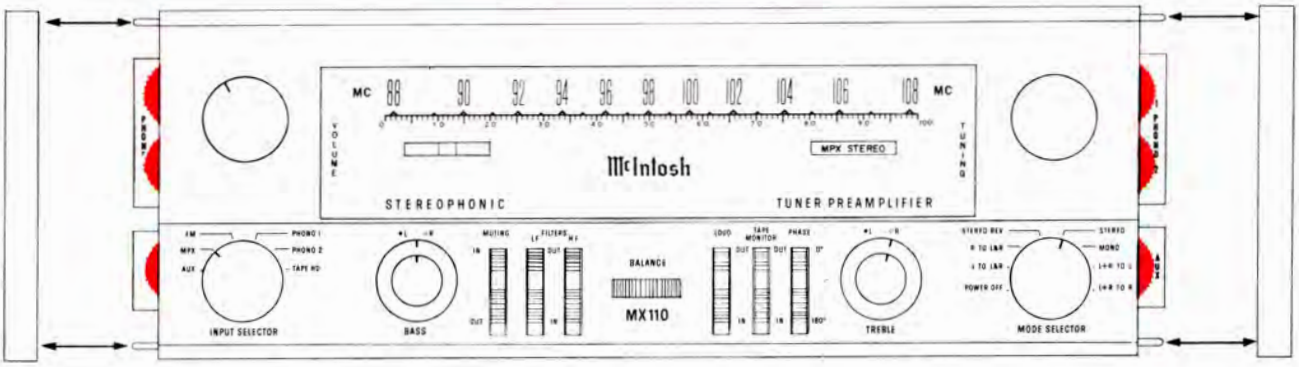


Figure 1. MX110 Front Panel

DIAL SCALES

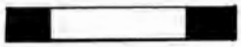
The MX110 has two scales. The 88 to 108 scale is marked in megacycles. The 0 to 100 scale is the logging scale. The logging scale is used to accurately retune any station. It is usually easier to keep a record of your favorite stations by use of the simple numbers on the logging scale.

INDICATORS

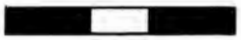
The MX110 has two indicators just below and near either end of the logging scale. On the right-hand side is the MPX STEREO indicator. On the left-hand side is the tuning indicator.

The MPX STEREO indicator will light if the dial pointer crosses a station broadcasting MPX stereo. A special circuit is used to operate this panel indicator. This circuit automatically detects the 19KC MPX stereo signal while rejecting noise pulses of equal intensity. To operate the MX110 to listen to MPX stereo, refer to OPERATING INSTRUCTIONS page 18.

The tuning indicator uses the movement of two electron beams inside a vacuum tube to show when a station is precisely tuned. The beams move toward each other as the station comes into tune. The station is precisely tuned when the beams come closest together. The action of this indicator is substantially independent of the signal strength of the station. Only the very weakest signals will not close the beams. (See Figure 2.)



The tuning indicator off tune.



The tuning indicator on tune.

Figure 2. Precise Tuning of MX110

VOLUME

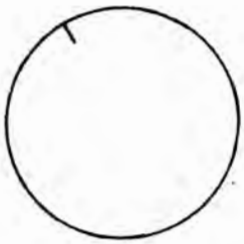


Figure 3. VOLUME control

The VOLUME control is the large knob located to the left-hand side of the dial face. The volume control adjusts the loudness of both stereo channels and also the L+R monophonic channel at the same time.

INPUT SELECTOR

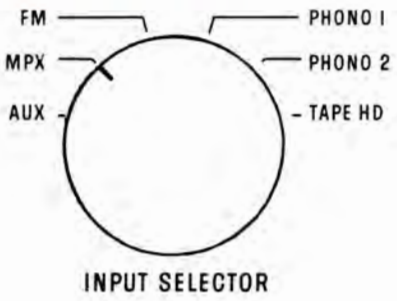


Figure 4. INPUT SELECTOR

1. AUX—The AUX position of the INPUT SELECTOR connects the back panel jacks marked AUX through the MX110. Use these jacks to connect any high level program source through the MX110. Connections are made following the instructions on page 0 in the section titled CONNECTING. Operating procedure is on page 18 in the section titled OPERATING INSTRUCTIONS.

2. MPX—The MPX position of the INPUT SELECTOR connects the multiplex decoder through the preamplifier portion of the MX110. Listen to stereo multiplex broadcasts in this portion. To properly connect and operate the MX110 to listen to FM stereo multiplex broadcasts, consult the sections titled CONNECTING and OPERATING INSTRUCTIONS, pages 11 and 18.

3. FM—The FM position of the INPUT SELECTOR connects FM monophonic programs through the tuner portions of MX110. To properly operate the MX110 to listen to FM monophonic broadcasts, consult the section titled OPERATING INSTRUCTIONS.

4. PHONO 1—The PHONO 1 position of the INPUT SELECTOR connects the jacks on the back panel marked PH-1 MAG. and PH-1 XTAL through the MX110. Any stereophonic or monophonic magnetic phono cartridge plugged into the PH-1 MAG. jacks is fed through the MX110. Any constant amplitude cartridge such as a crystal or ceramic device plugged into the PH-1 XTAL jacks is fed through the MX110. To properly connect and operate the MX110 for use with phono cartridges, see the sections titled CONNECTING and OPERATING INSTRUCTIONS.

5. PHONO 2—The PHONO 2 position of the INPUT SELECTOR connects the jacks on the back panel marked PH-2 through the MX110. Any magnetic phono cartridge plugged into the PH-2 jacks is fed through the MX110. To properly connect and operate the MX110 for use with phono cartridges, see the sections titled CONNECTING and OPERATING INSTRUCTIONS.

6. TAPE HD—The TAPE HD position of the INPUT SELECTOR connects the jacks on the back panel marked TAPE HEAD through the MX110. A tape deck that does not contain its own playback preamplifier is connected to the MX110 through this position. To properly connect and operate the MX110 for use with tape decks, consult the sections titled CONNECTING and OPERATING INSTRUCTIONS.

MODE SELECTOR

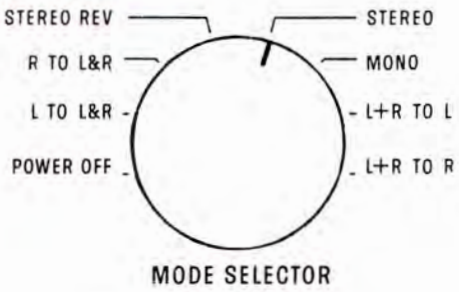


Figure 5. MODE SELECTOR

1. POWER OFF—The MX110 is off when the MODE SELECTOR switch is turned to the POWER OFF or extreme left position. The two black AC OUTLETS on the rear panel are also turned off in this position. The red outlet is connected directly to the power cord bypassing this switch. A turntable or record changer is plugged into the RED outlet. This outlet is not switched so that the turntable power will not be turned off while the turntable idler wheel is engaged. With this arrangement it is necessary to turn off the turntable with its own control switch. This prevents damaging the turntable idler wheel which would happen if the turntable was turned off while its idler wheel was engaged.

2. L TO L&R—The MODE SELECTOR in the L TO L&R position connects the left input to both amplifiers and loudspeakers.

3. R TO L&R—The MODE SELECTOR in the R TO L&R position connects the right input to both amplifiers and loudspeakers.

4. STEREO REV—The MODE SELECTOR in the STEREO REV position connects the left input to the right loudspeaker and right input to the left loudspeaker.

5. STEREO—The MODE SELECTOR in the STEREO position connects the left input to the left loudspeaker and the right input to the right loudspeaker.

6. MONO—The MODE SELECTOR in the MONO position adds the left input to the right input by paralleling and connects L+R to both amplifiers and loudspeakers.

7. L+R TO L—The MODE SELECTOR in the L+R TO L position adds the left input to the right input by paralleling and connects L+R to the left loudspeaker.

8. L+R TO R—The MODE SELECTOR in the L+R TO R position adds left input to the right input by paralleling and connects L+R to the right loudspeaker.

BASS

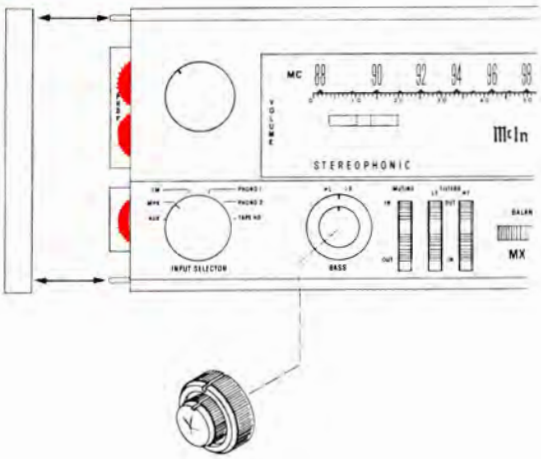


Figure 6. BASS controls

The BASS control is a friction-coupled dual-concentric construction. The center knob controls the left channel. The outer ring controls the right channel. With this control it is possible to vary the bass loudness relationship existing between the L and R speakers. Both controls can be turned together as a single adjustment or one may be held as the other is turned. Clockwise rotation increases bass loudness; counterclockwise rotation decreases bass loudness.

TREBLE

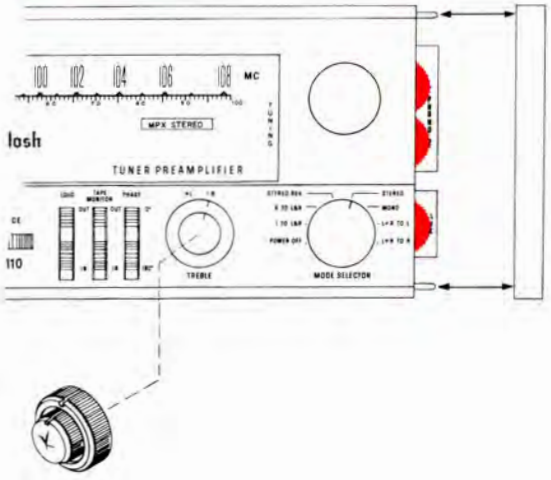


Figure 7. TREBLE controls

The TREBLE control is a friction-coupled dual-concentric construction. The center knob controls the left channel. The outer

ring controls the right channel. With this control it is possible to vary the treble loudness relationship existing between the L and R speakers. Both controls can be turned together as a single adjustment or one may be held as the other is turned. Clockwise rotation increases treble loudness; counterclockwise rotation decreases treble loudness.

MUTING

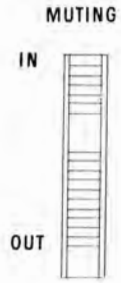


Figure 8. MUTING

Between station noise including the noise usually heard when tuning in and out of a station is eliminated by placing the MUTING switch in the IN position.

FILTERS

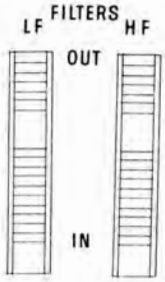


Figure 9. LF and HF-FILTERS

Low-frequency rumble noise below 50 cps created by a turntable or record changer is reduced by pushing the LF rumble filter switch to the IN position. Acoustically coupled feedback is also reduced by this switch. Surface noise is minimized when reproducing old, badly worn recordings by pushing the HF filter switch to the IN position.

BALANCE

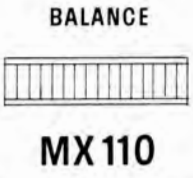


Figure 10. BALANCE

The BALANCE control balances the MX110 for unequal program sources. Turning the control to the left accents the left channel by reducing the right channel output. Turning the control to the right accents the right channel by reducing the left channel output.

LOUD

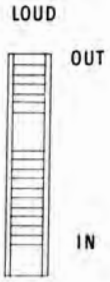


Figure 11. LOUD

Music reproduced at a very low volume loses its bass and treble due to a selective shift in the sensitivity of human hearing. When the LOUD. switch is moved to the IN position it converts the VOLUME control to a loudness compensated control to correct for this effect.

TAPE MONITOR

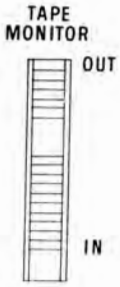


Figure 12. TAPE MONITOR

The TAPE MONITOR switch instantaneously compares recorded material with the source signal by operating the TAPE MONITOR switch from the IN position to the OUT position. Jacks marked TAPE MONITOR are located on the back panel and accept a signal from a tape machine which has a third head and a preamplifier for it. When the TAPE MONITOR switch is in the OUT position, the program source is fed through the power amplifiers and the loudspeakers. When the TAPE MONITOR switch is in the IN position, the signal source becomes the monitored program from the recorded tape and is fed through the power amplifiers and loudspeakers. When the TAPE MONITOR switch is operated in the IN position, signal from any other source will not be heard from the loudspeakers. When not in use, make sure the switch is in the OUT position. (Note: A tape machine with its own playback preamplifier could be used in this input connected by means of the TAPE MONITOR switch instead of being connected thru the AUX circuit of the INPUT SELECTOR.)

PHASE

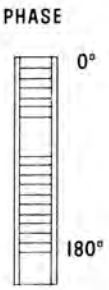


Figure 13. PHASE

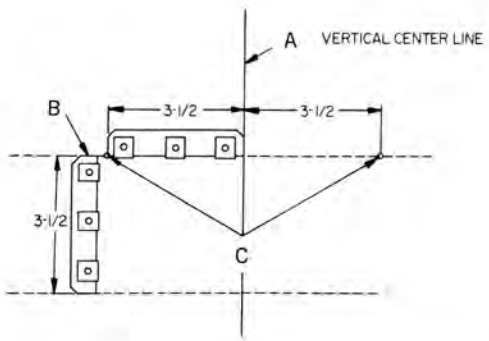
The PHASE switch corrects for loudspeaker or program phasing. Placing this switch in the 180° position reverses phase in the left channel.

INSTALLATION

The MX110 can be installed in conventional furniture cabinets, custom built installations or professional relay racks. If the unit is to be placed on a shelf or table-top, it is recommended that it be housed in a McIntosh cabinet. Install the MX110 from the front of the cabinet, not from the rear.

To support the weight of the MX110, the wood panel used to mount it should be at least ¼ inch thick. If the front panel of a cabinet is made of wood, a shelf may be needed to support the rear of the chassis to prevent warping. When the MX110 is mounted on a metal rack panel, a shelf is not needed.

The MX110 installation should allow 12⅞ inches behind the front panel which includes 1½ inches for connectors. The desirable width and height of the installation are 16½ inches and a minimum of 5½ inches, respectively, so that sufficient space is allowed for the circulation of air. These are inside dimensions. The front panel mounting space width and height are 16⅜ inches and 5⅜ inches, respectively. Allow at least 1½ inches for knob clearance in a custom built installation.



Positions "A" to "C" show the location of the vertical center line, the use of the measuring tool (mounting strip) to locate the horizontal center line, and how to measure off the two points to the right and left of the vertical center line.

Figure 14. Cutout Measurements

MAKING THE FRONT PANEL CUTOUT

The panel is cut out using the "FRONT PANEL CUTOUT TEMPLATE." To position the template on the front of the panel, make two locating holes from the back (inside) of the panel using one of the mounting strips (½ inch by 3½ inches) as a measuring tool. Proceed as follows:

Scribe a vertical center line through the exact center of the proposed cutout area from the top of the panel to the top surface of the shelf as illustrated in "A," Figure 14. Using one of the mounting strips as a measuring tool, draw a horizontal line 3½ inches above the shelf. (See "B," Figure 14.) Place a mounting strip along the horizontal line to the left of the vertical center line and mark a point 3½ inches left from the vertical center line. Repeat this procedure and mark a point 3½ inches to the right of the vertical center line. These points should now be 3½ inches up from the top of the shelf and 7 inches apart, one 3½ inches to the left and one 3½ inches to the right of the vertical center line. (See "C," Figure 14.) Drill a 3/16 inch hole at each point. Hold the drill perpendicular to the front panel so that the hole will be located accurately on the front of the panel.

Position the template on the front of the panel using the two locating holes to line it up correctly. Scribe the rectangular opening on the front of the panel and mark the position of the six mounting holes. Drill the six 3/16 inch mounting holes before cutting the panel opening. Then cut out the opening. It is important that the cutout be just within the lines.

SHELF MOUNTING

If the installation requires a shelf, proceed as follows: Locate the center of the shelf and scribe a line from front to back. The "SHELF CUTOUT PLATE" is marked for panel thicknesses from ¼ inch to 1 inch. Fold the template on the line that corresponds to the thickness of the panel. Place it on the shelf so that it butts against the inside of the panel. Match the center line mark on the template to the scribed center line on the shelf. Mark the position of the four drill holes. Drill the four ¼ inch holes.

INSTALLING THE MX110

Remove the four screws holding the MX110 to the shipping pallet. (Save these screws, you will need them if your cabinet has a ¼ inch or 3/8 inch shelf.) Remove the four plastic feet from the bottom of the MX110.

In the mounting hardware package are four 6–32 flathead screws and eight 6–32 roundhead screws. Two of the flathead screws of the proper length are used to attach the mounting strips to the cabinet. Four of the roundhead screws of the proper length are used to attach the MX110 to the cabinet and mounting strips. The 6–32 x ½ inch screws are to be used with panels ½ inch to 1 inch in thickness.

Select the proper length 6–32 flathead screws and use them to install the two mounting strips behind the front panel. Be sure that the edge of the strip with the clips is toward the panel opening. Line up the mounting strips on each side of the front panel cutout so the three holes in the strip are in line with the three holes in the panel. (See Figure 15.) Install the proper length flathead screws in the center hole of each strip. Drive them in so the flatheads are flush with the panel; if necessary, countersink the two center holes.

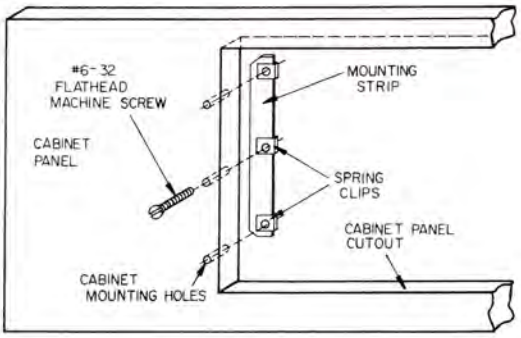


Figure 15. Securing the Mounting Strip to the Front Panel

Carefully insert the MX110 through the front of the panel opening so that it rests on the shelf. Insert the proper length 6–32 roundhead screws into the four holes in the mounting flanges on each end of the tuner-preamplifier front panel. Drive them in, but do not tighten.

If the cabinet is fixed and will not be moved about, it is not necessary to secure the MX110 chassis to the shelf. If the cabinet is to be moved about, it is recommended that the MX110 chassis be secured to the shelf. The four 10–32 x ½ inch screws used in

shipping are supplied for use if the shelf is under 3/8 inch. Use the 10–32 x 3/4 inch screws if this shelf is 1/2 inch or 5/8 inch thick and the 10–32 x 1 inch screws if the shelf is 3/4 inch or 7/8 inch thick. Secure the chassis with the proper length 10–32 machine screws, inserting them from beneath the shelf. Do not tighten the 10–32 screws until you have tightened the front panel screws. Use of the wrong length 10–32 screws may cause electrical shorting in the circuit.

Attach the two metal panel end caps (packed with mounting hardware) on each end of the panel by sliding onto the pins. (See Figure 16.) The end caps are held by spring tension and can easily be removed if the chassis is to be taken out of the cabinet.

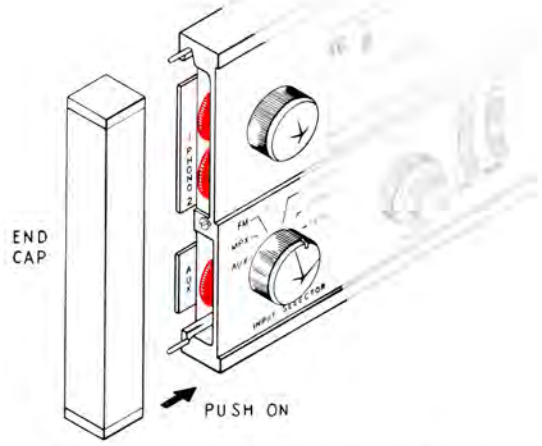


Figure 16. Fitting of Panel End Caps to Panel

MOUNTING IN THE L66 CABINET

The McIntosh L66 cabinet is supplied with complete instructions and all necessary hardware for installing the MX110. The dimensions of the L66 are 16 3/16 inches wide by 6 11/16 inches high, including mounting feet, by 13 3/4 inches deep, including the front panel and control knobs.

CONNECTING

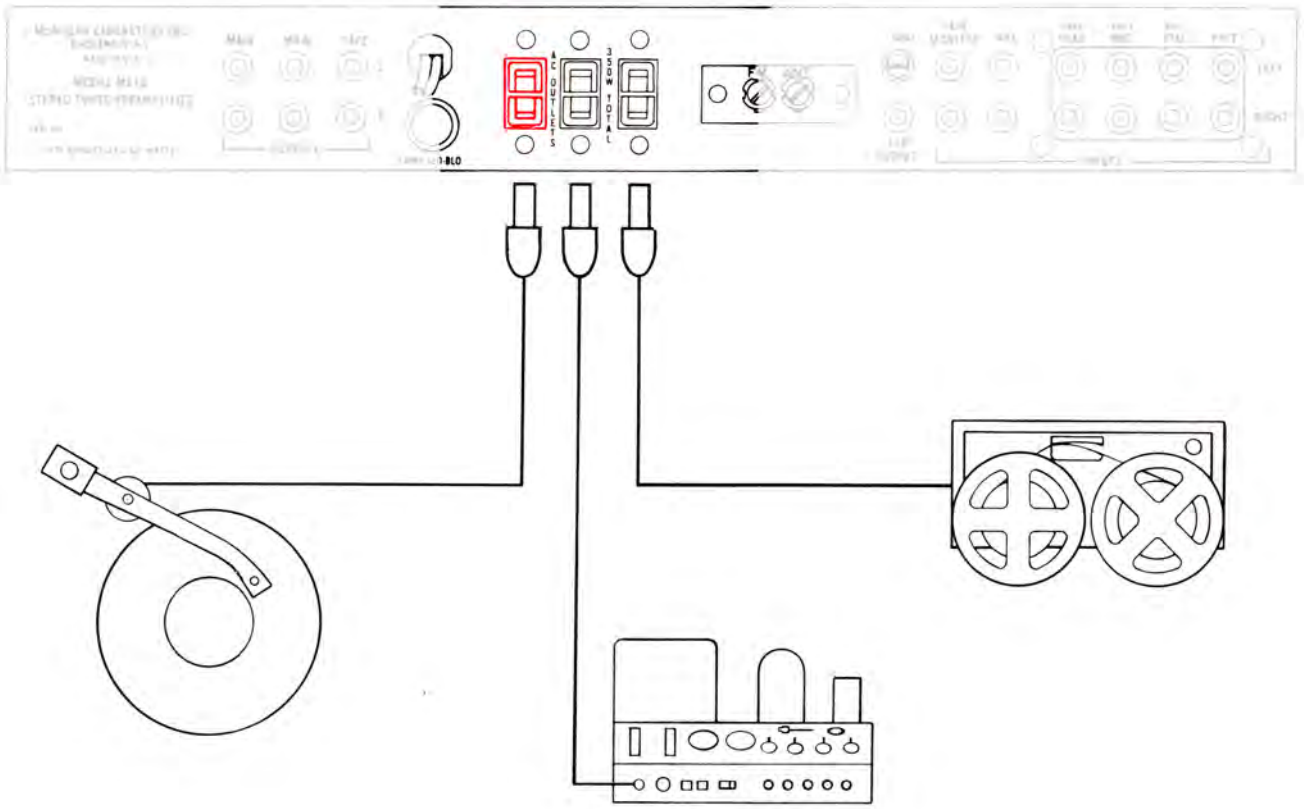
AC CONNECTIONS

There are three AC outlets on the rear panel of the MX110. (See Figure 17.) These receptacles have a maximum rating of 350 watts total. The two black receptacles are controlled by the POWER OFF position on the MODE SELECTOR switch on the front panel. The red receptacle is not switched. The red receptacle is used for powering a turntable or record changer. The receptacle is not switched so that the turntable power will not be turned off while the turntable idler wheel is engaged. The turntable is protected by this arrangement because it is necessary to turn off the turntable with its own control switch so that no damage will result to the drive system.

INPUT CONNECTIONS

The MX110 provides six separate program inputs controlled by the INPUT SELECTOR switch and one input for tape monitor or comparison controlled by the TAPE MONITOR switch.

The input program connections should be made in accordance with Table 1.



If a cartridge requires less than 47,000 ohms load impedance, a resistor can be added across the terminals of the cartridge to achieve the correct termination. The following chart may be used as a guide:

Desired Impedance	Resistor Across Input
47,000 ohms (47K)	No Resistor
37,000 ohms (37K)	180,000 ohms (180K)
27,000 ohms (27K)	62,000 ohms (62K)
15,000 ohms (15K)	22,000 ohms (22K)
6,800 ohms (6.8K)	8,200 ohms (8.2K)

Table 1. Input Connections

CONNECTION	FUNCTION	INPUT SENSITIVITY	INPUT IMPEDANCE
TAPE MONITOR	The tape input operates with tape machines containing their own playback preamplifier.	0.3 volts	100,000 ohms (100K)
AUX	The auxiliary input accepts any auxiliary service requiring flat frequency response, such as a T.V. set, etc.	0.3 volts	200,000 ohms (200K)
TAPE HEAD	This jack is used with a tape deck that does not contain its own playback preamplifier.	2.5 millivolts (2.5/1000 of 1 volt)	220,000 ohms (220K)
PH-1 MAG. & PH-2 MAG.	These jacks are to be used with magnetic cartridges.	3 millivolts (3/1000 of 1 volt)	47,000 ohms (47K)
PH-1 XTAL	These jacks are to be used with a constant amplitude cartridge such as a crystal, ceramic, or frequency-modulated device.	0.1 volts	220 mmf in series with 56K

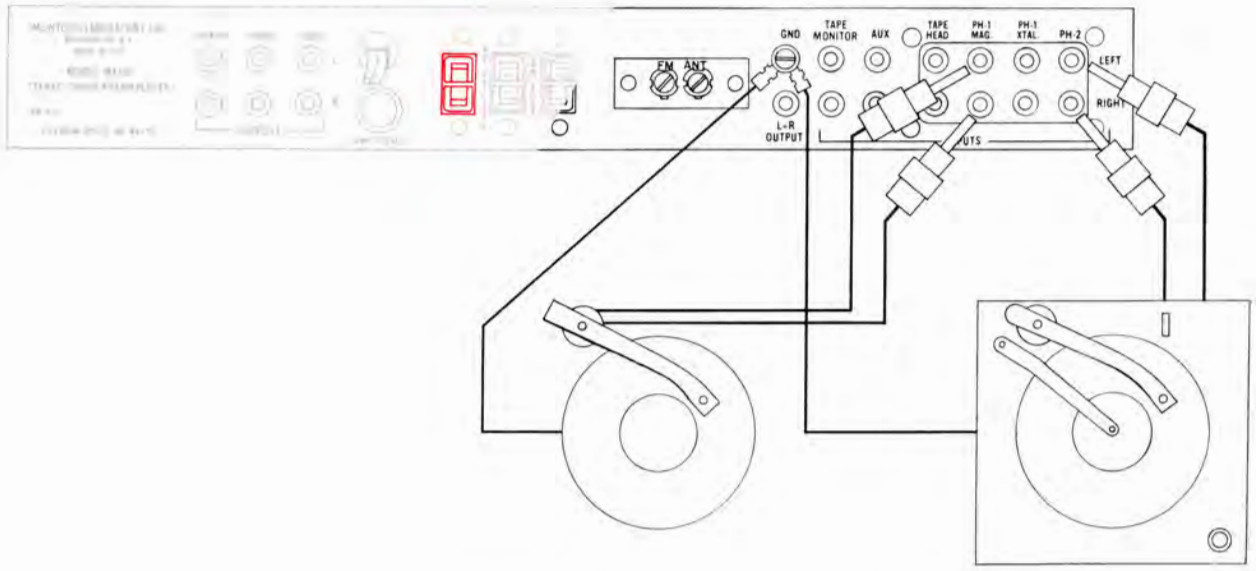


Figure 18. MX110 Input Connections (Back Panel)

OUTPUT CONNECTIONS

There are two sets of outputs in the upper left-hand corner of the back panel. (See Figure 19.)

The MAIN output connects to power amplifiers (Figure 19) and the TAPE output to feed a tape recorder.

The MAIN and TAPE output jacks are fed from cathode followers. The input impedance of devices connected to these outputs should be 100,000 ohms or greater. Longer cables than are normally supplied can be connected between the MX110 and the amplifiers or loudspeakers. The length of the cable is limited by the capacity of the cable per foot. The total capacity must not exceed 1000 mmf. For instance: cables with a capacity of 25 mmf per foot may be 40 feet long; 13.5 mmf per foot cable may be 75 feet long.

A left plus right output jack is under the GND screw. It is marked L+R. A monophonic signal can be distributed to other rooms by connecting a third power amplifier to the jack marked L+R. This amplifier is used to drive monophonic loudspeakers. The cable connecting to this output should not have a capacity of more than 1000 mmf. The input impedance of the power amplifier connecting to this output should not be less than 150,000 ohms (150K).

ANTENNA CONNECTIONS

For the satisfactory operation of a multiplex decoder, more signal is needed than for monophonic reception. Monophonic installations that are satisfactory on an indoor antenna may require the use of an outdoor antenna for equivalent results. Satisfactory stereo requires about 10 times as much signal from the antenna.

With the MX110 one of the three antenna systems can be used: (1) the indoor dipole supplied with the MX110, (2) an outdoor FM antenna, or (3) a VHF-TV antenna. In fringe areas best results will probably be obtained with the use of an outdoor FM antenna. In many areas the indoor dipole antenna is usually satisfactory. The use of a VHF-TV antenna is also effective in many installations. Make a choice after consulting the book on antennas titled "Themes and Variations" included with MX110.

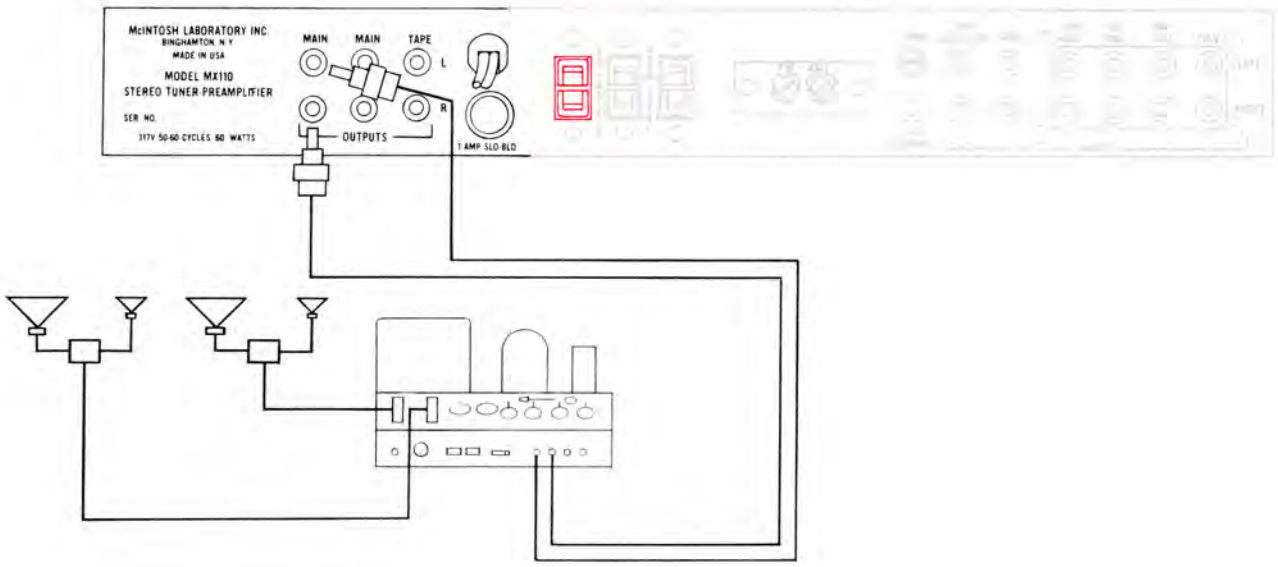


Figure 19. Output Connections

INDOOR DIPOLE ANTENNA

The flexible folded dipole antenna (300 ohm) supplied with the MX110 is for indoor use in urban or high intensity signal areas. The flexibility of the thin flat wire assembly permits it to be placed under a rug, tacked behind the hi-fi equipment enclosure . . . or, placed in any other convenient location. In some cases, it may be necessary to "position" the antenna for best signal reception. This should be done before it is permanently located or tacked down.

To position the dipole for best results the MX110 must be operating. The following procedure may be followed: Connect the two leads from the dipole to the terminals marked FM ANT on the rear of the chassis of the MX110, see Figure 20.

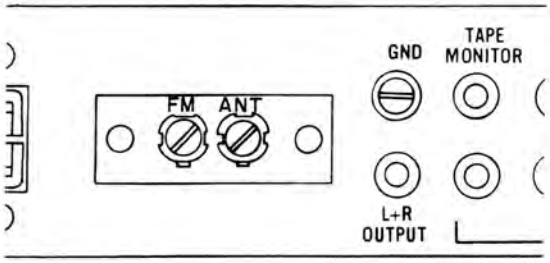


Figure 20. Connection for 300 ohm antenna

IMPORTANT:

BEFORE TURNING THE MX110 ON, CHECK TO SEE THAT ALL TUBES ARE FIRMLY SEATED IN THEIR SOCKETS, AND THAT ALL PLUGS ARE CORRECTLY AND FIRMLY INSERTED.

Turn the power on by setting the MODE SELECTOR to STEREO. Place the MUTING control in the OUT position. Open the dipole to a full "T" and tune the MX110 to a fairly weak station. Rotate and move the dipole about until the best reception is obtained. The dipole is now in the best position for maximum signal reception for this station. This is not a critical position; therefore you may permanently install the antenna in a position which most closely conforms to it.

IMPORTANT:

KEEP THE DIPOLE AWAY FROM METAL SURFACES, METAL DOORWAYS, ETC., AS THEY USUALLY INTERFERE WITH ITS EFFICIENCY.

OUTDOOR ANTENNA

An outdoor antenna is recommended for optimum performance in all areas. In fringe (outlying) areas, best results will be obtained with a highly directional FM antenna used in conjunction with a rotator. Rotate and move

the antenna about until the best reception is obtained. Connect the 300 ohm antenna to the terminal screws marked FM ANT as in Figure 21.

CONNECTING A 75 OHM COAXIAL ANTENNA LEAD

An unbalanced 75 ohm antenna can be connected to the MX110 with coaxial cable. Connect the center conductor to the right FM ANT screw and the shield to the grounding screw next to the antenna screw as in Figure 21. The McIntosh designed balun matches the 75 ohm input to the tuner for optimum performance.

AC POWER

Plug the AC power cord in 105 volt to 125 volt, 50 to 60 cycle power line. The power used by the MX110 is 75 watts.

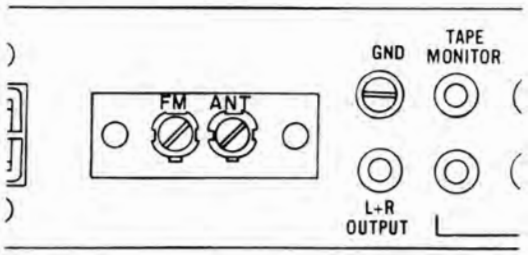


Figure 21. Connections for a 75 ohm antenna

OPERATING INSTRUCTIONS

BALANCING A STEREO SYSTEM

The performance of a stereo system and the enjoyment of listening to it are greatly increased by correctly balancing the system. A properly balanced stereo system must be in phase. Each channel must be equal in loudness and similar in frequency response.

Do not use the MX110 BALANCE control for this procedure. The MX110 BALANCE control is best used to adjust for any unbalance in the program source.

Before attempting to balance the MX110 make sure the controls on the amplifiers are set correctly. On the MC240 and MC275 turn the control marked BALANCE to its center position. On the MC225 set the input level controls for each channel to the black dot above the control.

To balance the MX110, proceed as follows: A familiar recording, either stereophonic or monophonic, should be used in balancing the MX110.

1. Turn the INPUT SELECTOR to the position corresponding to the program selected. (PHONO 1 for example if you're using a recording.)
2. Turn the BASS controls and TREBLE controls so that the dial indicator is centered between the panel markings • L and ° R.
3. Turn the MODE SELECTOR to the L+R TO L position.
4. Place the LOUD. switch in the OUT position.
5. Place the TAPE MONITOR switch in the OUT position.
6. Place the PHASE switch in the 0° position.
7. Place the LF rumble filter switch in the OUT position.
8. Place the HF cutoff filter switch in the OUT position.
9. Remove the front panel end caps and rotate the set level controls to full on. The controls are turned full on with an upward turning motion. The controls are turned clockwise on the left-hand side and counterclockwise on the right-hand side.
10. Turn the BALANCE control so that the flat portion on the thumb wheel is centered in the panel opening.
11. While the program is playing, alternate the MODE SELECTOR between the L+R TO L position and L+R TO R position. Adjust the gain control on the power amplifiers until the loudspeakers are of equal loudness.

The MX110 connects to the STEREO IN-

PUT jacks on the McIntosh MC240 Stereo 40 Watt Amplifier and the McIntosh MC275 Stereo 75 Watt Amplifier. To balance the system merely turn the balance control on the MC240 or the MC275 until the loudspeakers are of equal loudness.

When the MX110 is balanced this way it will remain balanced through all modes of operation.

12. The dual concentric tone controls correct unequal loudspeaker loudness in the bass range or treble range. To make this correction merely advance the control corresponding to the weaker loudspeaker or turn down the control for the stronger loudspeaker.

BALANCING LOUDNESS BETWEEN PROGRAM SOURCES

The MX110 has set level controls in the AUXILIARY, PHONO 1, and PHONO 2 inputs. These adjustments allow you to make the auxiliary and phono inputs the same loudness as the tuner. To make this adjustment proceed as follows:

1. Turn the INPUT SELECTOR to FM or MPX. Adjust the VOLUME control to a comfortable listening level.
2. Turn the INPUT SELECTOR to PHONO 1, PHONO 2, or AUX.
3. Locate the set level control corresponding to the program source selected in Step 2 of this procedure. Alternate the INPUT SELECTOR between the program sources selected in Steps 1 and 2 of this procedure and at the same time adjust the set level controls until the program sources are equal in loudness.
4. Repeat Step 3 for the remaining program sources of Step 2.

When making these adjustments be careful to maintain the same balance between the left and right channels as with the set level controls full on. It is easiest to check left to right balance using a monophonic record with the INPUT SELECTOR in the PHONO 1 or PHONO 2 position and a monophonic program source in the auxiliary position.

ADJUSTING PHASE

1. Set the MODE SELECTOR to STEREO.
2. Turn the BASS controls and TREBLE controls to straight up position so that the dial indicator centers between the panel markings • L and ° R.

Stand approximately 10 feet in front of and midway between the loudspeakers. The source of sound should appear to be directly in front of you. Alternate the PHASE switch between 0° and 180°. If the sound is not directly in front of you in the 0° position, reverse the leads to one loudspeaker. The PHASE control is used to correct phase in the source material whenever necessary.

LISTENING TO A STEREO RECORD

Upon completion of the connecting and balancing instructions, the MX110 is ready for use. To listen to stereo records, proceed as follows:

1. Set the MODE SELECTOR to STEREO.
2. Set the PHASE switch to 0°.
3. Set the HF cutoff filter to OUT. (See page 17 ADJUSTING FOR SPECIAL EFFECTS.)
4. Set the LOUD control to OUT. (See page 17 ADJUSTING FOR SPECIAL EFFECTS.)
5. Rotate the INPUT SELECTOR to PHONO 1 or PHONO 2 whichever is connected to the cartridge you wish to hear.
6. Set the BASS controls and TREBLE controls so that the dial indicator is centered between the panel markings • L and ° R.
7. Place the LF rumble filter control in the OUT position. (See page 17 ADJUSTING FOR SPECIAL EFFECTS.)
8. Adjust the VOLUME control to the desired volume.

ADJUSTING BALANCE CONTROL AFTER THE SYSTEM HAS BEEN BALANCED

If after balancing your system as outlined in this manual you then find that nearly all records always require an adjustment of the BALANCE control to one side of the center, the condition indicates an unbalanced stereo cartridge. This is not a disadvantage unless it indicates some other problem with the cartridge.

If the stereo sound seems to come from either side of the room instead of being distributed between the loudspeakers, adjust the PHASE control to 180°. This listening effect is due to reproducing sound that is out of phase from one channel to the other. You will find some records differ from others in this respect and that some tapes differ from records.

ADJUSTING FOR SPECIAL EFFECTS

HF Cutoff Filter. If you wish to reproduce old, badly worn records, you can minimize the surface noise by switching the HF cutoff filter to the IN position. (See section entitled "Front Panel Facilities.")

LF Rumble Filter. If you are using a turntable or changer which has low-frequency rumble noise, you may reduce it by pushing the LF rumble filter switch to the IN position.

Bass Controls and Treble Controls. The tone balance which you hear when listening to an orchestra is affected by the conductor's instructions to his musicians, the acoustical environment in which you are listening, and your own subjective hearing interpretation. Considering these conditions, it is easy to see why tone balance controls play a major role in correcting for the following factors:

1. Each person's subjective idea of tone balance.
2. Loudspeaker frequency response characteristics.
3. Loudspeaker placement in the listening room.
4. The conductor's idea of tone balance at the time the recording was made.
5. The microphone frequency response characteristics.
6. The recording process influences.

These factors can be considered as environmental influences. The BASS controls and TREBLE controls are designed to provide a degree of compensation for effects of environment. Listen to your system with each control set with the indicators centered between the panel markings • L and ° R. If you wish to reduce treble in relation to bass, rotate the TREBLE controls counterclockwise until the tone balance sounds correct to you. These controls will modify tone balance without introducing any undesirable effects. Do not be surprised if you find your preference in tone changing from time to time.

Loudness. Due to a selective shift in sensitivity of human hearing, music reproduced at very low volume loses its bass and treble.

The LOUD. switch on the MX110 changes the VOLUME control to a loudness control to correct for this effect. When you wish to listen to music at a greatly reduced loudness level and yet hear bass and treble, set the LOUD. switch to the IN position.

LISTENING TO TAPE DECKS

1. Turn the INPUT SELECTOR to the position corresponding to the program selected.
2. Turn the BASS controls and TREBLE controls so that the dial indicator is centered between the panel markings • L and ° R. (See page 7 BASS AND TREBLE CONTROLS.)
3. Turn the MODE SELECTOR to STEREO.
4. Place the TAPE MONITOR switch in the OUT position.
5. Place the PHASE switch in the 0° position.
6. Place the LF rumble filter switch in the OUT position. (See page 17 ADJUSTING FOR SPECIAL EFFECTS.)
7. Place the HF cutoff filter switch in the OUT position. (See page 17 ADJUSTING FOR SPECIAL EFFECTS.)
8. Place the LOUD. switch in the OUT position. (See page 17ADJUSTING FOR SPECIAL EFFECTS.)

LISTENING TO MONOPHONIC RECORDS

If you wish to listen to monophonic records, switch the INPUT SELECTOR to PHONO 1 or PHONO 2. Turn the MODE SELECTOR to the MONO position.

USING THE TUNER PORTION OF THE MX110

LISTENING TO A MONOPHONIC FM PROGRAM

1. Turn the INPUT SELECTOR to FM.
2. Turn the VOLUME control to its midpoint.
3. Place the MUTING switch in the IN position.
4. Turn the BASS controls and TREBLE controls until the dial marking is on top of the dial in a straight up position. (See page 7 BASE AND TREBLE CONTROLS.)
5. Turn the MODE SELECTOR to MONO.
6. Place the PHASE switch in the 0° position.
7. Place the LF rumble filter switch in the OUT position. (See page 17 ADJUSTING FOR SPECIAL EFFECTS.)

8. Place the HF cutoff filter switch in the OUT position. (See page 17 ADJUSTING FOR SPECIAL EFFECTS.)

9. Place the LOUD. switch in the OUT position. (See page 17 ADJUSTING FOR SPECIAL EFFECTS.)

After a warm up of about 30 seconds, turn the tuning knob to find the station of your choice.

While tuning the MX110 you may notice the meter indicating a station yet no program is heard from the speakers. The muting circuit in the tuner is rejecting the station because there is objectionable noise with the weak signal from the station. Turn the MUTING switch to the OUT position and the station will be heard. Most programs that can be tuned in this manner are of poor quality due to interfering noise.

LISTENING TO FM STEREO MULTIPLEX

If you are tuning the MX110 and the red MPX indicating light comes on, this indicates a multiplex broadcast. To listen to this program:

1. Turn the INPUT SELECTOR to MPX.
2. Turn the MODE SELECTOR to STEREO.

LISTENING TO A STEREO TAPE MACHINE

A stereo tape machine with its own playback preamplifiers should be plugged into the AUX input or the TAPE MONITOR input —not the TAPE HEAD input. The information on adjusting the MX110 for listening to a stereo tuner will also apply when listening to a tape machine.

OPERATING CURVES

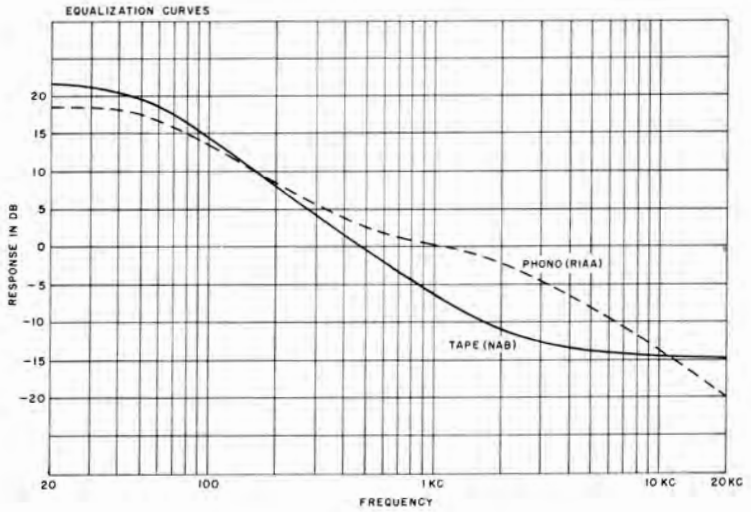


Figure 22. Equalization Curves

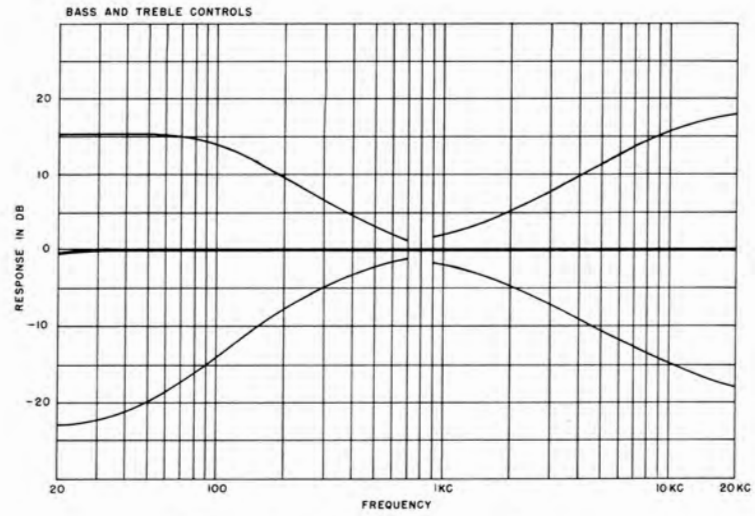


Figure 23. Bass and Treble Controls

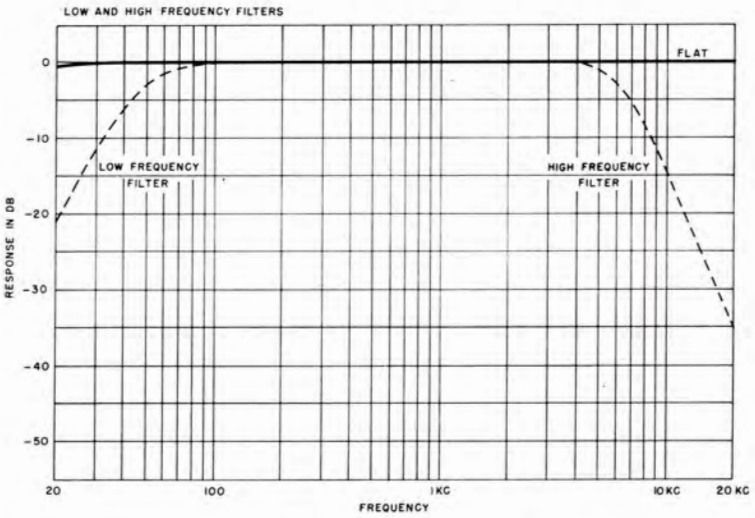


Figure 24. L.F. Filter and H.F. Filter

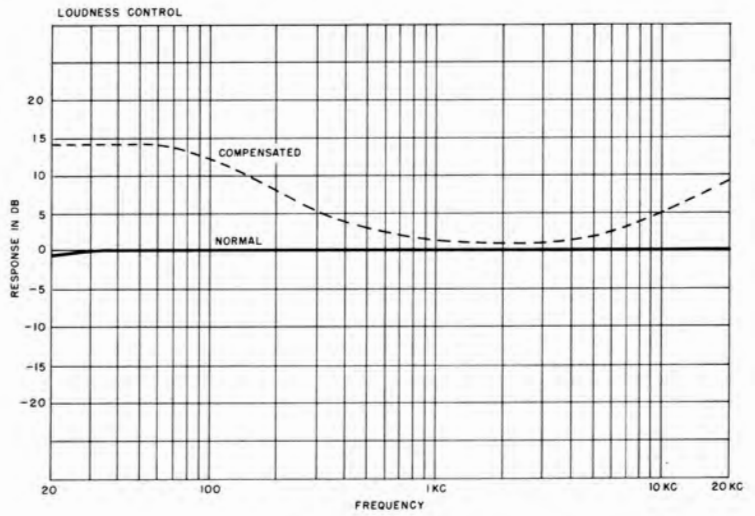


Figure 25. Loudness Control

Your MX110 will give you many years of pleasant and satisfactory performance. If you have any questions concerning the operation or maintenance of this preamplifier please contact:

Customer Service
McIntosh Laboratory Inc.
2 Chambers Street
Binghamton, New York

Our telephone number is 723-5491.
The direct dial area code is 607.

GUARANTEE

McIntosh Laboratory Incorporated guarantees this equipment to perform as advertised. We also guarantee the mechanical and electrical workmanship and components of this equipment to be free of defects for a period of 90 days from date of purchase. This guarantee does not extend to components damaged by improper use nor does it extend to transportation to and from the factory.

3-YEAR FACTORY SERVICE CONTRACT

An application for a FREE 3-YEAR FACTORY SERVICE CONTRACT is included in the pocket in the back cover of this manual. The FREE 3-YEAR FACTORY SERVICE CONTRACT will be issued by McIntosh Laboratory upon receipt of the completely filled out application form. The term of this contract is defined in the 3-year factory service contract. If the application is not mailed to McIntosh Laboratory, only the services offered under the standard 90-day guarantee will apply on this equipment. TAKE ADVANTAGE OF 3 YEARS OF FREE FACTORY SERVICE BY FILLING IN THE APPLICATION NOW.

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