

McIntosh  
MX 112

# OWNER'S MANUAL

**McINTOSH MX 112 FM/FM STEREO-AM TUNER - PREAMPLIFIER**



Price \$1.25

Your MX112 FM/FM stereo, AM tuner and stereo preamplifier will give you many years of pleasant and satisfactory performance. If you have any questions concerning operation or maintenance please contact the dealer from whom you purchased this instrument or:—

### CUSTOMER SERVICE

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

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

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### GUARANTEE

McIntosh Laboratory Incorporated guarantees this instrument to be capable of performance as advertised. We also guarantee the mechanical and electrical workmanship and components to be free of defects for a period of 90 days from date of purchase. If such defects occur, McIntosh Laboratory or

one of its authorized agencies will repair the defect at no cost to the purchaser. This guarantee does not extend to components damaged by improper use nor does it extend to transportation to and from the factory or service agency.

### THREE YEAR FACTORY SERVICE CONTRACT

An application for a FREE THREE YEAR FACTORY SERVICE CONTRACT is included with this manual. The terms of the contract are:

For Three Years from date of purchase —

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.
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. The SERVICE CONTRACT is given to purchasers who live in the 50 United States or Canada only.
6. For your protection McIntosh selects its dealers carefully. Only one dealer in ten qualifies for a McIntosh franchise. To receive the SERVICE CONTRACT your purchase must be made from a McIntosh franchised dealer.
7. Your completely filled in application for a SERVICE CONTRACT must be postmarked within 30 days of the date of purchase of the instrument.
8. 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. If the application is not received at McIntosh Laboratory, only the service offered under the 90-day guarantee will apply.



## Installation

Adequate ventilation extends the trouble-free life of electronic instruments. It is generally found that each 10° centigrade (18° F) rise in temperature reduces the life of electrical insulation by one half. Adequate ventilation is an inexpensive and effective means of preventing insulation breakdown that results from unnecessarily high operating temperatures. The direct benefit of adequate ventilation is longer, trouble-free life.

Allow at least 15 inches deep x 17½ inches wide x 6 inches high for mounting the MX 112. Always allow for air flow by either ventilation holes or space next to the bottom of the instrument and a means for warm air to escape at the top.

It is recommended that the MX 112 be mounted in a normal or horizontal position. However, with adequate ventilation the instrument can be mounted in any position.



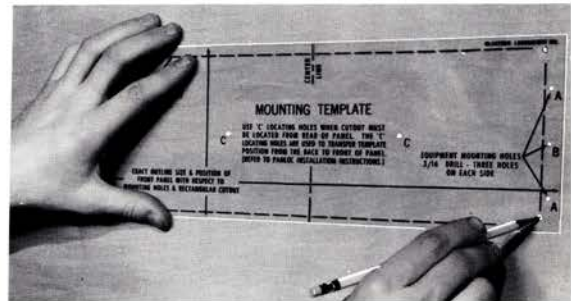
To prepare the MX 112 for installation remove the plastic protective covering. Turn the MX 112 upside down so that it rests on its top on the shipping pallet. Remove the four plastic feet fastened to the bottom of the chassis.

Next, place the mounting brackets, the parts bag and the mounting template at hand.

The PANLOC professional mounting design eliminates the need for any shelf or bracket to support the MX 112. It is completely supported by its own mounting brackets.

The design of the mounting template allows you to position or locate the cutout from the front or rear of the panel to which the instrument is to be mounted. Position the plastic mounting template over the area of the panel to be cut out for installation.

If the cutout is to be located from the front of the panel, begin at 2. If the cutout is to be located from the rear of the panel, begin here.



1. On the back of the cabinet panel, scribe a vertical centerline through the exact center of the area in which the cutout is to be made.

Place the template against the back of the panel and match the template centerline with the centerline on the cabinet panel.

Make sure that there is at least ¼ inch clearance between the bottom of the dashed line of the cutout area on the template and any shelf or brace below the proposed cutout.

Mark the two locating holes ("C" holes on the mounting template).

Drill the two locating holes. Be certain the drill is perpendicular to the panel.

Now position the template on the front of the panel by aligning the "C" locating holes on the template with the drill holes.

2. If the cutout is to be located from the front of the panel:

With the template in place against the cabinet panel, mark the "A" and "B" drill holes and the four small holes that identify the corners of the

cutout. Join the corner marks with a pencil. The edge of the template can be used as a straight edge.

**IMPORTANT: DRILL THE 6 HOLES BEFORE MAKING THE CUTOUT.**

Accurately drill the three holes on each side of the cutout area with a  $\frac{3}{16}$  inch drill.

With the saw on the **INSIDE OF THE PENCIL LINES** carefully cut out the rectangular opening.

Secure the mounting strips to the rear of the cabinet panel using two screws from the hardware package.

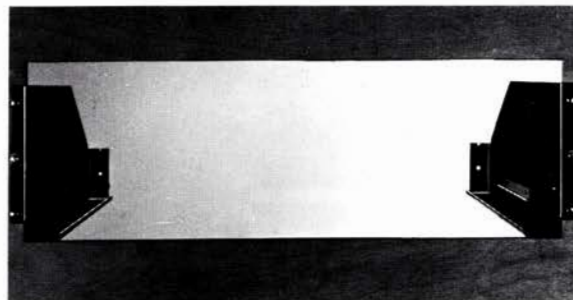


Insert the screws in the center holes of the cabinet panel ("B" holes on the template) and tighten. The screw head should pull into the wood slightly. (Use two  $\frac{3}{4}$  inch long screws for panels under  $\frac{1}{2}$  inch, or two  $1\frac{1}{4}$  inch long screws for panels  $\frac{1}{2}$  inch thick and larger.)

Attach the mounting brackets to the cabinet panel using four screws.

Place the template over the mounting screws. The mounting screws should be centered in the "A" and "B" holes on the template. The sides of the mounting brackets should match the vertical dash lines on the template. If necessary, loosen the screws and push the brackets into alignment and retighten.

Insert the power cord through the opening. Carefully slide the MX112 into the opening so the rails on the bottom of the equipment slide in the track of the mounting brackets. Slide the instrument in until it stops at the adjust position latches. Press the latches in and continue to slide the instrument in until the front panel is against the cabinet panel. At the bottom front corners of the PANLOC instruments

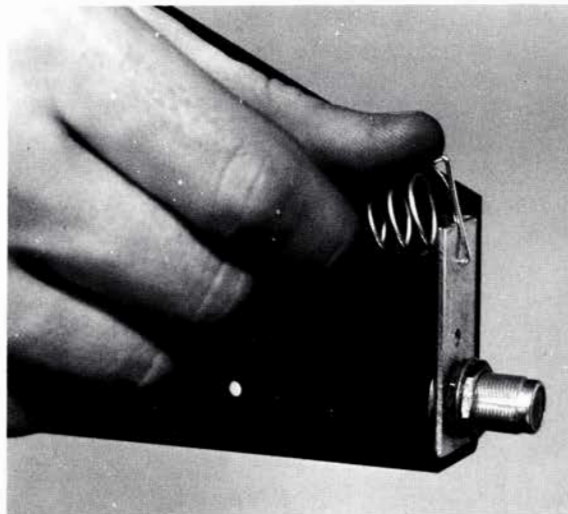


are the PANLOC buttons. Depressing the PANLOC buttons will lock the instrument firmly in the installation. Depressing the PANLOC buttons a second time (as with a ball point pen) will release the instrument. You can then slide the instrument forward to the inspection-adjustment position. Depressing the inspection-adjustment position latches will allow the instrument to be slid completely out of the installation.

#### **VERTICAL INSTALLATION**

For vertical installations follow the procedure above. You may wish to add two release assisting springs; in the hardware packet are two helical springs. Fasten the springs to the small flanges at the rear of the PANLOC brackets. The flange has a notch and a hole to mount the spring. The springs assist in the removal of vertically mounted PANLOC equipment.

**DO NOT USE THE SPRINGS ON HORIZONTALLY MOUNTED EQUIPMENT.**



# How to Connect

## CONNECTING A RECORD PLAYER TO PHONO 1

Connect the cable from the left channel of the record player into the L PHONO 1 input jack.

Connect the cable from the right channel of the record player into the R PHONO 1 jack.

PHONO 2 is provided for the use of a second record player.

Connect the cable from the left channel of the record player into the L PHONO 2 input jack.

Connect the cable from the right channel of the record player into the R PHONO 2 input jack.

## AUX

Any high level program source such as another tuner or a TV set can be connected to the input jacks marked AUX.

## CONNECTING A TAPE RECORDER

### To record:

Connect a cable from the L TAPE OUTPUT jack to the left high level input of a tape recorder.

Connect a cable from the R TAPE OUTPUT jack to the right high level input of the tape recorder.

### To Playback/Monitor

Connect the cable from the left channel output of a tape recorder to the high level inputs . . . L TAPE.

Connect the cable from the right channel output of a tape recorder to the high level inputs . . . R TAPE.

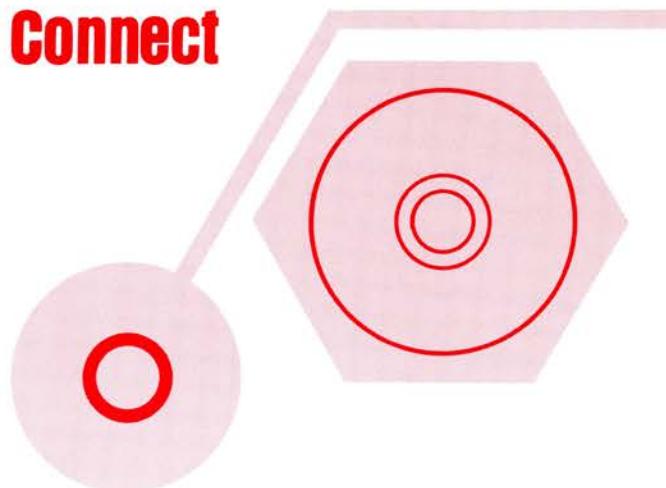
## CONNECTING THE MX 112 TO POWER AMPLIFIERS

Connect the MAIN OUTPUT jacks to the input of a stereo power amplifier. The L jack is connected to the left amplifier input jack. The R jack is connected to the right amplifier input jack.

The output impedance at the MAIN OUTPUT is 200 ohms. Longer cables than are supplied can be connected between the MX 112 and the amplifier. The length of the cable is limited by the capacity of the cable. The total capacity must not exceed 1,000 pF. For instance: cables with a capacity of 25 pF per foot may be 40 feet long. 13.5 pF per foot cable may be 75 feet long. The input impedance of the amplifiers should be 47,000 ohms or greater.

### L + R Output:

Use the L + R OUTPUT to feed left plus right signal to a separate power amplifier for monophonic background music or for a center channel speaker.



## CONNECTING AN FM ANTENNA

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 MX 112 one of three antenna systems can be used: (1) the indoor dipole supplied with the MX 112, (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 may be satisfactory. The use of a VHF-TV antenna is also effective in many installations.

## CONNECTING AN INDOOR DIPOLE ANTENNA

The flexible folded dipole antenna (300 ohm) supplied with the MX 112 is for indoor use in urban or high strength signal areas.

Connect the two leads from the dipole to the terminals marked FM ANT (red). The flexibility of the thin flat wire assembly permits it to be placed under a rug, tacked behind the stereo . . . 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.

## CONNECTING AN OUTDOOR FM 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 the antenna until the best reception is obtained. Connect the 300 ohm antenna to the terminals marked FM ANT (red).

### CONNECTING A 75 OHM COAXIAL ANTENNA

An unbalanced 75 ohm antenna can be connected to the MX 112 with coaxial cable. Connect the center conductor to the left FM ANT (Red) connector. The shield is connected to the GND (black) connector.

The McIntosh designed balun matches the 75 ohm input to the tuner for optimum performance.

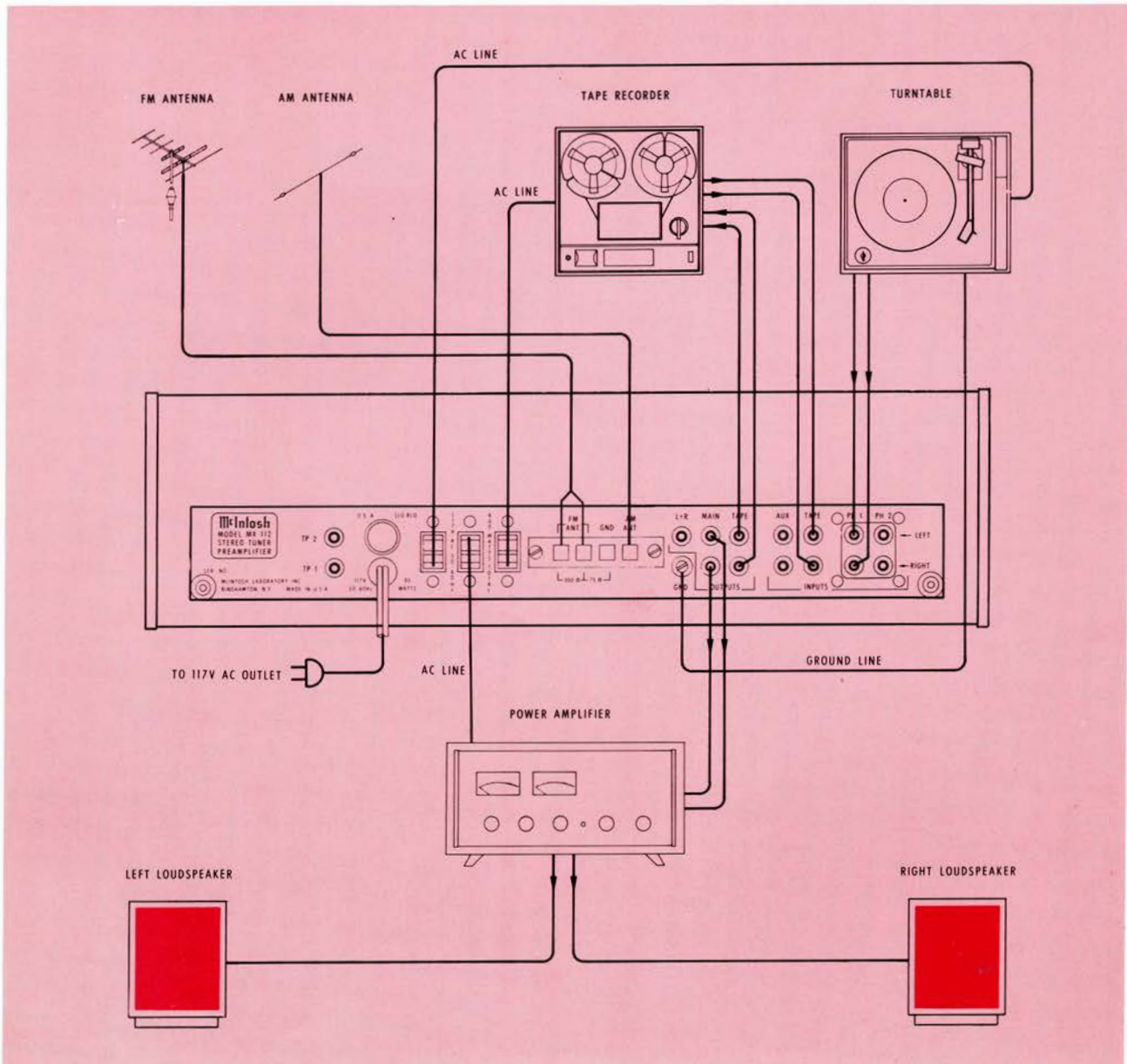
### AC POWER OUTLETS

There are 2 black AC power outlets, and one red AC power outlet. The power to the black outlets is controlled by the front panel switch. Use these outlets for a power amplifier, or tape recorder, etc. The red receptacle is on at all times. Use the red outlet

for a turntable or record changer. The turntable is protected by this arrangement. It is necessary to turn off the turntable or record changer with its own AC power switch.

### GROUND CONNECTION

A single ground post is provided. Grounds for turntables, record changers, tape decks, etc. should be connected to this post. The left and right program cables and the ground wire from that source should be wound or twisted together. To avoid hum, make sure the ground wire does not make any connections to the shields of the left and right program cables between the program source and the MX112.





## Front Panel Information

### INPUT SELECTOR:

**AUX:** Connects the output from any high level program source requiring flat amplification to the high level input stage. Such a source could be a television set. In the AUX position the gain is 20 dB to the MAIN outputs and 0 dB to the TAPE outputs. The input impedance is 250,000 ohms.

**TAPE:** Connects the output from a complete tape recorder to the high level input stage of the MX 112. The TAPE position has flat amplification. The gain is 20 dB to the MAIN outputs. The gain is 0 dB to the TAPE outputs.

**AM:** Connects the AM tuner portion of the MX 112 to the output jacks.

**FM:** Connects the FM tuner portion of the MX 112 to the output jacks.

**PHONO 1:** Connects the output of any magnetic phono cartridge to the low level input stage. The response has been shaped to compensate for the characteristics of the magnetic phono cartridge. The gain at 1000 Hz is 62 dB to the MAIN outputs; 42 dB to the TAPE outputs. The input impedance is 47,000 ohms.

**PHONO 2:** Same as PHONO 1.

### BASS

The BASS is a concentric control. The large outer knob controls the low frequency response in the right channel. The small center knob controls the low frequency response in the left channel. The two knobs are friction coupled. This permits them to be adjusted together or independently. Clockwise rotation increases lows and counterclockwise decreases lows. Position the control to the center position for flat response.

### TREBLE

The TREBLE is a concentric control. The outer knob controls the high frequency response in the right channel. The small center knob controls the high frequency response in the left channel. The two knobs are friction coupled. This permits them to be adjusted together or independently. Clockwise rotation increases highs and counterclockwise decreases highs. Flat is the center position.

### BALANCE

The BALANCE control adjusts for unequal volume in either the left or right channels. The volume of each channel can be varied relative to each other without affecting their combined loudness.

**LEFT . . .** turning the control to the left accents the left channel by reducing the right channel output.

**RIGHT . . .** turning the control to the right accents the right channel by reducing the left channel output.

### VOLUME ON/OFF

Turning the VOLUME totally counterclockwise turns the MX 112 OFF. The VOLUME control regulates the loudness in both channels. The VOLUME control has been precision tracked throughout the listening range (0 to -65 dB) for accurate stereo balance.

## Using the Pushbuttons

**MODE SELECTOR: STEREO:** The left channel is heard from the left loudspeaker and the right channel is heard from the right loudspeaker.

**MONO (L + R):** The left and right channels are added together and are heard from both loudspeakers.

**LF FILTER:** With the pushbutton pushed in the low frequency response is attenuated below 50 Hz. The

slope is 6 dB per octave. Use of the LF filter reduces unwanted low frequency noise such as rumble. With the pushbutton released, the response of the MX 112 is flat.

**HF FILTER:** With the pushbutton pushed IN the high frequency response is attenuated above 5000 HZ. The slope is 6 dB per octave. Use of the HF filter reduces unwanted high frequency noise like hiss or scratch. With pushbutton released, the response of the MX 112 is flat.

**TAPE:** The TAPE pushbutton is used to monitor tape as it is being recorded. With the pushbutton IN, the recorded tape is heard. Release the button and the program being recorded is heard. Instantaneous comparison of recorded material and the program source is provided by the use of the TAPE pushbutton.

**IMPORTANT:** When the MX 112 is operated with the TAPE pushbutton in the IN position, signal from any other source will not be heard from the loudspeakers. To hear any other source, make sure the pushbutton is in the OUT position.

**MUTING:** Muting suppresses the background noise and hiss normally heard between stations. With the control in the IN position the muting is turned on. Weak stations that may not override noise and interference are also suppressed by the muting. In the OUT position, the muting is turned off. This allows conventional FM tuning with the noise and interference present. Use this position to tune weak or noisy stations.

**LOUD:** When the volume is reduced, the music will seem to lose much of its bass and some of its treble. This effect is due to the sensitivity characteristic of human hearing. The response of the human ear to bass and treble pitch decreases more rapidly than its response to notes centered in the mid-tonal range. The LOUD control automatically provides the correct amount of bass required to compensate for this change in response of the human ear at low-loudness levels. The LOUD converts the volume control to a loudness compensated control. Use the LOUD IN to listen at low volume and still hear full-frequency range.

**PANLOC:**

McIntosh developed PANLOC mounting brings

professional installation technique to stereo. Depressing the PANLOC buttons (as with a ballpoint pen) will release the instrument. It can then be pulled toward you to the "adjustment" position. In this position the top panel controls can be adjusted.

## Balancing your Stereo

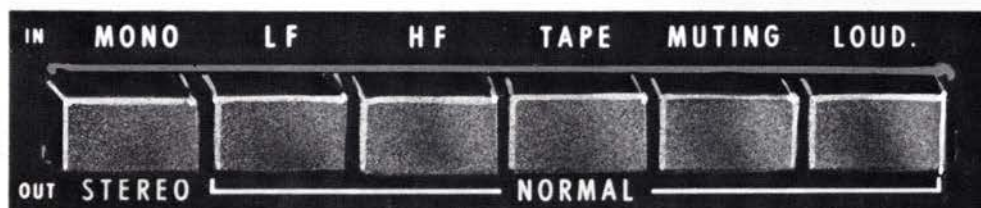
The performance and enjoyment of a stereo system is greatly increased when the sound is properly balanced. The balance of the stereo system is affected by many things including room acoustics, furniture placement, room shape, small differences in loudspeakers, etc. Factors that effect proper stereo balance are correct phase for both channels and equal program loudness.

### TO ADJUST PHASE

1. Press the MODE pushbutton to the MONO position.
2. Stand about 10 feet in front of and midway between the loudspeakers. The sound should appear to come from directly in front of you. If the sound is not directly in front of you with the PHASE switch in the 0° NORMAL position, reverse the leads on one loudspeaker. When the sound comes from the midpoint between the speakers they are in PHASE.

### TO BALANCE LOUDNESS

1. Press the MODE pushbutton to the MONO position.
2. Play a familiar recording.
3. Turn the BALANCE control to the 12 o'clock position.
4. While the program is playing, stand between the two loudspeakers. Listen for a difference in loudness between speakers. Balance the system by adjusting the controls on the power amplifiers. Next, set the MODE selector to STEREO. If there is then a difference in loudness turn the BALANCE control toward the speaker that is not as loud. Adjust the BALANCE control until the sound is balanced between both speakers.





# Listening to Your Stereo System

## LISTENING TO A STEREO RECORD

Turn the INPUT SELECTOR to PHONO 1 or PHONO 2, whichever is connected to the record player you wish to hear.

Make certain the MODE PUSHBUTTON is in the OUT or STEREO position.

Adjust the VOLUME control to desired volume.

## LISTENING TO A MONOPHONIC RECORD

Turn the INPUT SELECTOR to PHONO 1 or PHONO 2, whichever is connected to the record player you wish to hear.

Push the MODE pushbutton IN to MONO.

Adjust the VOLUME control to desired volume.

## LISTENING TO A STEREO TAPE RECORDER

Turn the INPUT SELECTOR to TAPE.

Set the MODE pushbutton to STEREO or MONO, depending on the program on the tape.

Adjust the VOLUME control to desired volume.

To monitor while recording, the tape recorder must have separate record and playback heads. The TAPE pushbutton permits monitoring the tape recordings while in the process of recording. When the TAPE pushbutton is in the IN position it will play the sound from the tape as it passes the playback head, a moment after it is recorded. The recording process continues as usual. When the TAPE pushbutton is in the OUT position the program being recorded is heard.

## LISTENING TO AM

Turn the INPUT SELECTOR to AM.

Adjust the volume to a comfortable level.

Rotate the tuning knob of the station of your choice.

## LISTENING TO FM or FM STEREO

Turn the INPUT SELECTOR to FM.

Adjust the volume to a comfortable level.

Rotate the tuning knob to the station of your choice.

The MX 112 uses a new McIntosh developed automatic mono-stereo switching circuit. The switching is electronic without switching clicks or transients.

The circuit switches smoothly and silently when the 19,000 Hz multiplex carrier is present. When the

STEREO indicator is lit, the station is broadcasting a 19,000 Hz carrier. This signal causes the automatic circuit to switch the MX 112 to stereo. If a station is broadcasting monophonic FM program, the STEREO indicator will remain off and the tuner will automatically switch to mono. The ultrasonic muting circuit suppresses all noise between stations. It suppresses all weaker stations not strong enough to override the background noise. The muting threshold setting determines the strength of the signal which can be heard with muting in operation. The muting threshold is carefully adjusted to optimum at the factory. Casual adjustment of the muting threshold is not recommended.

While tuning you may notice that the tuning indicator will show a station yet no program is heard from the speakers. The muting circuit in the tuner has rejected the station because there is objectionable noise with the weak signal from the station. Push the MUTING pushbutton 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.



# Performance Limits

**Performance Limits** are the maximum deviation from perfection permitted for a McIntosh instrument. We promise you that the MX 112 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.

## PERFORMANCE LIMITS

### FM

**USABLE SENSITIVITY:** 2.5 microvolts at 100% modulation ( $\pm 75$  kHz deviation) for less than 3% total noise and harmonic distortion (IHF).

**FREQUENCY RESPONSE:**  $\pm 1$  dB from 20 Hz to 20,000 Hz with standard de-emphasis and 19,000 Hz pilot filter

**HARMONIC DISTORTION:** Mono, 0.5% at 100% modulation  $\pm 75$  kHz deviation

**IMAGE REJECTION:** 75 dB at 100 MHz, 70 dB at 105 MHz

**SPURIOUS REJECTION:** 90 dB

**CAPTURE RATIO:** 1.8 dB

**DRIFT:** 25,000 Hz at an ambient temperature of 25° C

**HUM AND NOISE:** 65 dB below 100% modulation

**TUNING INDICATOR:** Electron Ray for simple accurate center of channel tuning

**STEREO INDICATOR:** Stereo light activated by 19,000 Hz carrier only

### AM

**SENSITIVITY:** 12 microvolts at 1,000 kHz (using external antenna input)

**SIGNAL TO NOISE RATIO:** 55 dB

**HARMONIC DISTORTION:** 1% at 30% modulation

**FREQUENCY RESPONSE:** Down 6 dB at 5,000 Hz and 34 dB at 10,000 Hz

**SELECTIVITY:** 10,000 Hz at -6 dB

**IMAGE REJECTION:** 60 dB at 1,000 kHz

### PREAMPLIFIER

**FREQUENCY RESPONSE:**  $\pm 0.5$  dB 20 to 20,000 Hz

**DISTORTION:** 0.1% at 2.5 volts output, 20 to 20,000 Hz

**INPUT SENSITIVITY AND IMPEDANCE:** PHONO 1 and PHONO 2: 2 millivolts at 47,000 ohms (1,000 Hz) output

AUX TAPE: 0.25 volts at 250,000 ohms

### VOLTAGE AMPLIFICATION:

#### AUX, TAPE

To MAIN output 20 dB

To TAPE output 0 dB

#### PHONO 1, PHONO 2

To MAIN output 62 dB

To TAPE output 42 dB

**HUM AND NOISE:** PHONO 1 and PHONO 2: 70 dB below 10 millivolt input; equivalent to less than 3 microvolts at the input terminals

AUX-TAPE: 85 dB below rated output

### TRANSISTOR COMPLEMENT:

4 junction FET, 4 MOS FET, 27 Silicon Planar

2 Integrated Circuits (each contains the equivalent of 10 transistors and 7 diodes), 20 diodes

1 6HU6 tuning indicator

**POWER REQUIREMENTS:** 117 volts, 50/60 Hz, 30 watts.

### FACILITIES AND FEATURES

**BASS CONTROL:** -20 dB to +16 dB at 20 Hz.

**TREBLE CONTROLS:**  $\pm 20$  dB at 20,000 Hz.

**LOUDNESS:** Flat response, or compensated for low listening levels.

**TAPE MONITOR:** Pushbutton; compares recorded tape with program source while recording

**LF FILTER:** Flat, or roll-off below 50 Hz

**HF FILTER:** Flat, or roll-off above 5 kHz

**PHASE CONTROL:** Electronically reverse phase in the left channel to correct "out of phase" program sources

**MUTING ADJUST:** Modifies the noise rejection threshold

**DIAL SCALE INTENSITY:** Modifies the briteness of the illumination of the front panel

### MECHANICAL

**SIZE:** Front panel: 16 inches wide by 5 $\frac{1}{4}$  inches high; Chassis: 15 inches wide by 13 inches deep, including PANLOOC shelf and back panel connectors; Knob Clearance: 1 $\frac{1}{2}$  inches in front of mounting panel

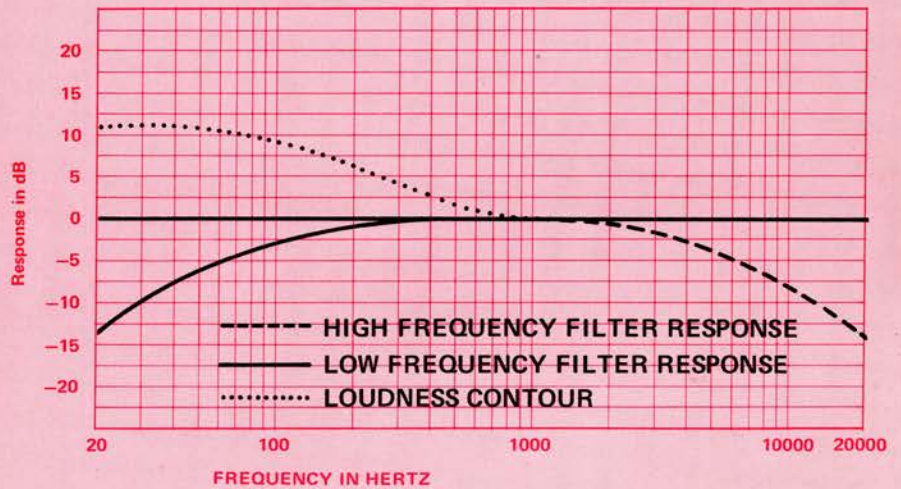
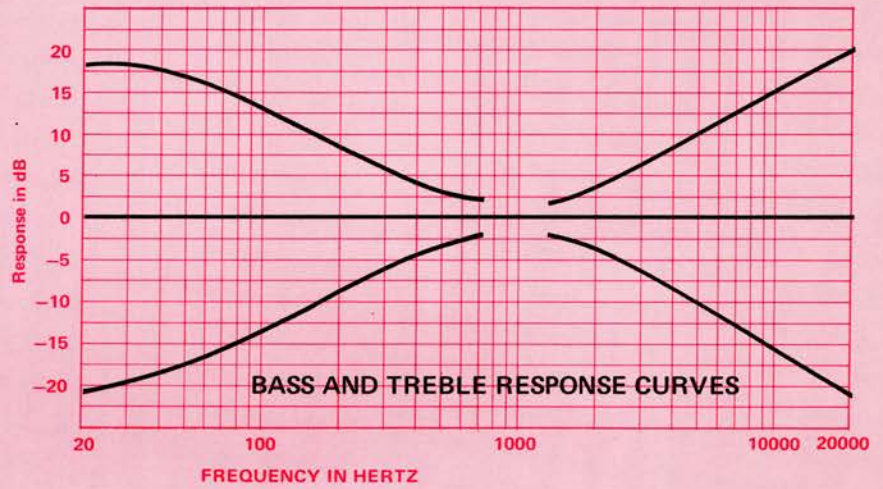
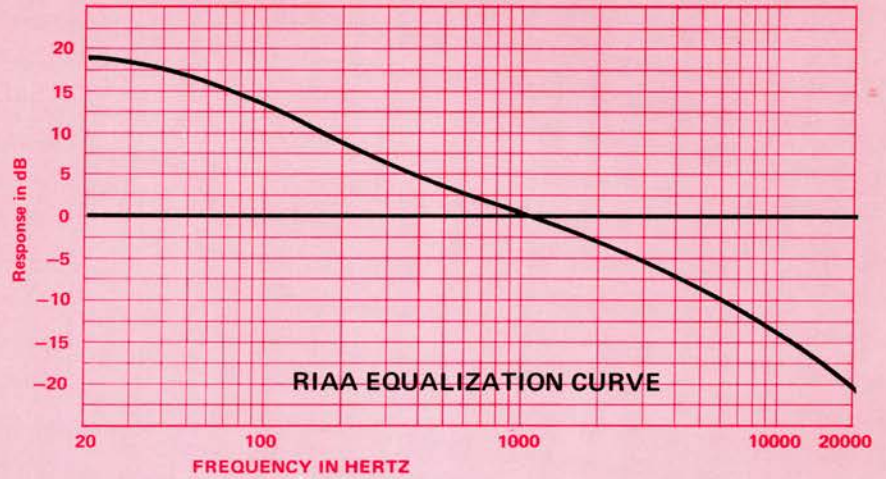
**WEIGHT:** 25 pounds net, 37 pounds in shipping carton

**FINISH:** Front panel: Anodized gold and black with special gold/teal panel nomenclature illumination

**CHASSIS:** Chrome and black

**MOUNTING:** McIntosh developed professional PAN-LOC

# Performance Charts



# AM FM

## Technical Description

### FM SECTION:

The FM consists of two separate modular sections:

#### A. THE RF SECTION:

This section houses the complete FM front-end and part of the AM-RF circuit.

The FM circuit employs three junction field effect transistors, two of which form the very high frequency amplifier in a series-fed "cascode" type circuit, giving maximum gain at minimum thermal noise.

This VHF amplifier is preceded by a double-tuned circuit and is followed by a mixer circuit employing the third junction field effect transistor and a single-tuned circuit.

The FM local oscillator is designed for minimum response to temperature variations, making automatic frequency control unnecessary. The drift rate is less than 10 parts per megahertz per degree centigrade.

The RF circuits of the MX112 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 MX112.

A VHF television antenna which is suitable for FM reception can be connected to the MX112. For maximum performance we recommend a good FM yagi or log-periodic antenna with rotator.

#### B. THE FM-IF AND DETECTOR SECTION:

This section employs two integrated circuit devices, each capable of amplifying the intermediate frequency signal from the mixer by a thousand times (60 dB). Lumped selectivity in the form of two sets of quadruple-tuned bandpass filters insure good intermediate frequency skirt selectivity. The tuned circuits that make up the bandpass filters are designed for electrical stability and for electrical and mechanical resistance to shock and vibration.

"Hard" limiting is accomplished by the use of the two integrated circuits. The limiting is complete at very low levels of input signals.

A phase or Foster-Seeley discriminator is used as the FM detector, and is designed for extremely low harmonic distortion in the recovered output signal. With the "Hard" limiting properties of the preceding two stages a low capture ratio is obtained.

#### FM STEREO MULTIPLEX SECTION:

The multiplex section uses a special McIntosh developed detecting circuit. A particular advantage of this circuit is the elimination of the critical adjustments necessary with commonly used matrixing circuits. This circuit detects the L - R sidebands and automatically matrixes the recovered information with the L + R main carrier signal to yield the left and right program output with maximum separation.

The 19,000 Hz pilot signal is filtered from the composite stereo input signal, amplified by a special limiting amplifier, doubled to the 38,000 Hz carrier frequency, and then amplified again by a limiting amplifier. The composite signal minus the 19,000 Hz pilot is combined with the 38,000 Hz carrier signal and fed to the special detector circuit mentioned above. Balanced full wave detectors are used to cancel the 38,000 Hz components in the output.

A three section phase linear sharp cut off filter rejects SCA interference without destroying stereo separation.

FM muting, automatic FM stereo switching, and an FM stereo indicator are also part of the multiplex section. The FM muting operates by detecting ultrasonic noise which is present when tuning between stations or when receiving a weak station. The FM muting operates equally well, of course, when receiving mono or stereo stations. The automatic FM stereo switching activates the stereo multiplex circuits when receiving FM stereo. On mono FM stations this circuit is inactive and therefore maximum signal to noise ratio is assured at all times.

The FM stereo indicator is lit when the tuning dial pointer crosses a station broadcasting FM stereo.

The light does not indicate when tuning between the stations.

#### **AM SECTION:**

The AM circuit employs only field-effect transistors for top performance, increased reliability, and temperature stability.

The use of dual-insulated gate, field-effect transistors in the RF and Mixer circuits insures freedom from cross-modulation and overloading by strong local stations.

A 10,000 Hz whistle filter is connected at the detector output to attenuate any heterodyne that occurs due to the frequency separation between adjacent AM carriers.

A highly sensitive loopstick antenna is provided. An outside antenna may be used for added "pulling-in" capabilities.

#### **TUNING MECHANISM and DIAL DRIVE:**

In the MX 112, a new type of mechanical tuning assembly gives smooth flywheel tuning.

By controlling the relationship of mass and mechanical resistance, and by dividing the workloads in the dial drive system, it becomes nearly impossible to detect any backlash. Yet, the entire dial drive is a model of mechanical stability.

The tuning capacitor rotors of both AM and FM sections are mounted on the same shaft.

For added ease and increased tuning accuracy, a section of the dial pointer is illuminated.

#### **PHONO PREAMPLIFIER**

There are three transistors in each channel of the phono preamplifier. The output of the third transistor is connected by a negative feedback loop to the emitter of the input transistor. The feedback loop reduces noise and distortion. It also provides precision RIAA frequency compensation required for magnetic phonograph cartridges. Feedback remains in effect even at 20 Hz, where gain is highest. The negative feedback also provides a low output impedance for the tape output.

Phono input overload is virtually impossible. For example, at 1,000 Hz, the phono input can accept 150 millivolts of signal without overload. Ten millivolts of signal at the phono input at 1,000 Hz will produce 1.2 volts at the tape output.

The selector switch connects either the output of the phono amplifier, the FM tuner section, the AM tuner section or a high level input to the main preamplifier. The high level input impedance is 250,000 ohms. The high level input feeds directly to the volume control. A loudness contour circuit is connected

to a tap on the volume control to provide loudness compensation. Compensation can be switched in or out. The high level signal then feeds to a pair of transistors connected as high gain amplifiers.

In the left channel the second transistor is connected in a balanced output arrangement. This circuit provides equal amplitude signals so that the output level does not change when the phase is reversed. Negative feedback is used around this pair of transistors to reduce noise and distortion. The negative feedback provides the low impedance needed to drive the highly selective filter networks which follow.

The filter networks can be switched in or out. The high-frequency filter network reduces treble response above 5,000 Hz. The low-frequency filter reduces bass response below 50 Hz. The slope of the filters is selected for maximum rejection of commonly encountered noise. Careful design keeps the loss of usable program material to a minimum.

The output from the filter circuits is fed into the balance control. The output of the balance control drives the first stage of the tone control section. The remaining two transistors are connected as a high-gain amplifier stage. The high-gain of this stage is used to advantage for the tone control negative feedback circuits. Negative feedback in the tone control circuits assures low distortion and accurate shape on the tone-control response curves. Negative feedback is maintained at all frequencies, even with the tone controls turned to full boost. Overall distortion is low at all frequencies including frequencies where maximum boost occurs. The negative feedback also provides the low impedance output required for the main preamplifier outputs.

#### **CENTER CHANNEL AMPLIFIER**

The L + R amplifier consists of a single transistor connected as a voltage amplifier. Negative feedback is used around the voltage amplifier to maintain low distortion and provide a low impedance for the center channel output.

#### **POWER SUPPLY:**

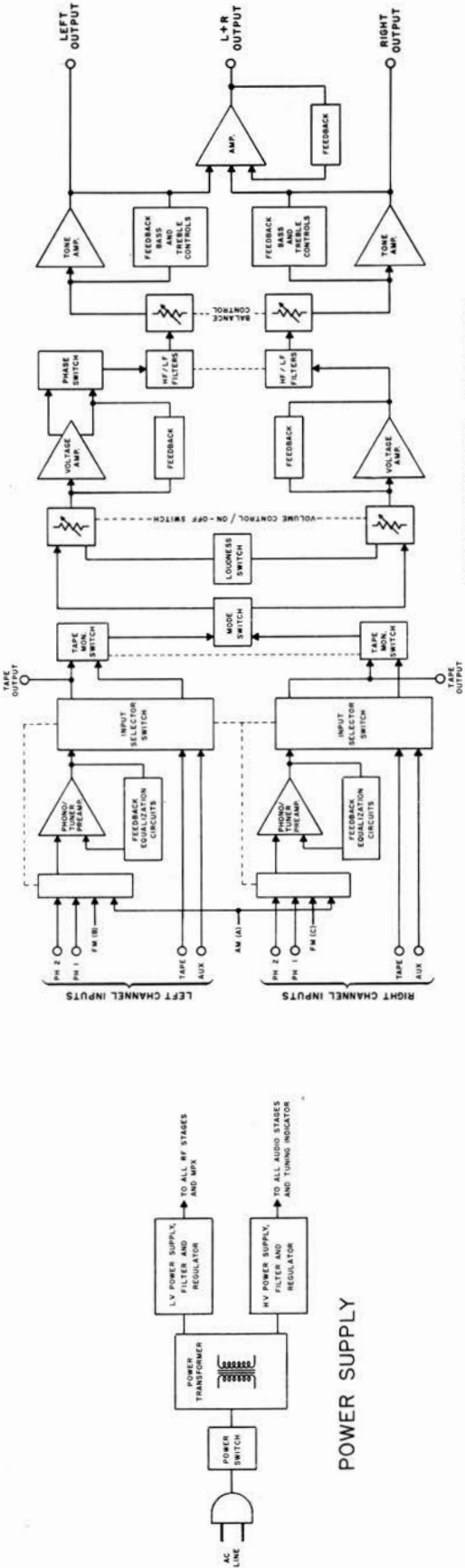
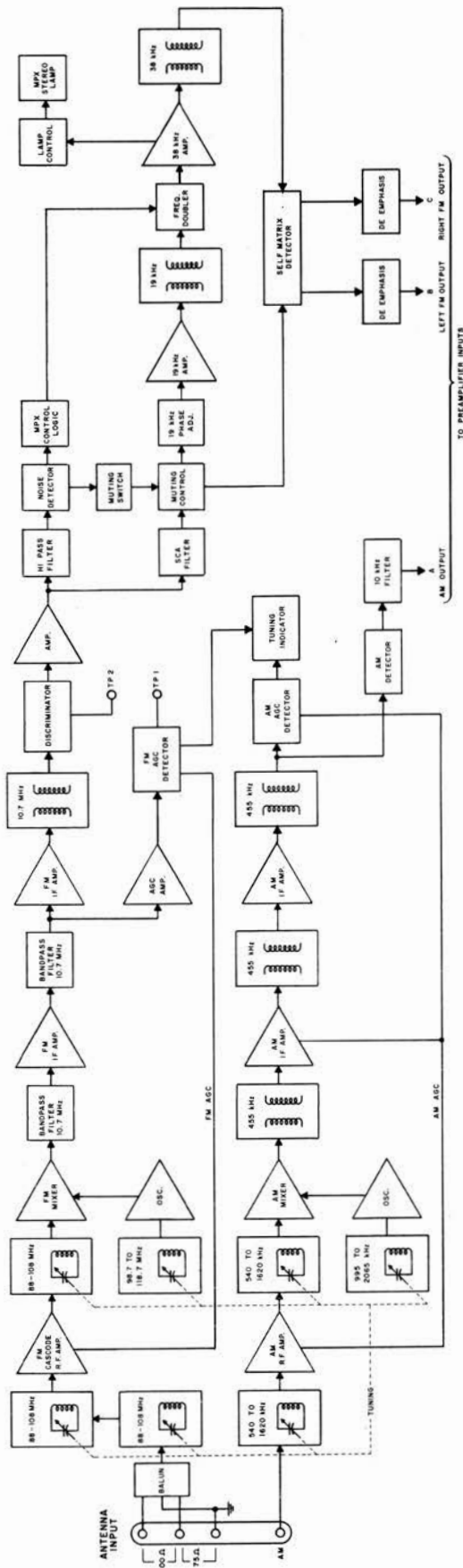
The power supply of the MX 112 has received very special design attention.

Two separate rectifier circuits are used. First, a full-wave rectifier supplies D. C. to all audio circuits. The second full-wave rectifier supplies D. C. to all tuner and multiplex-decoder circuits.

Both power supplies are very elaborate in design. They use electronic filtering to insure the lowest possible background hum level, maximum stability, and extremely good regulation.

# Block Diagram

## FM/AM TUNER SECTION



## PREAMPLIFIER SECTION

# McIntosh

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Design subject to change without notice.

Printed in U.S.A.

038-447