McIntosh
MX113

OWNER'S MANUAL

THE McINTOSH MX113 FM/FM STEREO-AM TUNER-PREAMPLIFIER

Reading Time: 45 Minutes

Price $1.25

Your MX 113 AM-FM/FM stereo tuner and stereo preamplifier will give you many years of pleasant and satisfactory performance. If you have any questions 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.

CONTENTS

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.

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 113. 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.

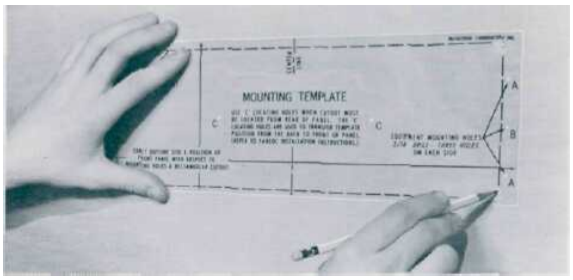
With adequate ventilation, the MX 113 can be mounted in any position.

To prepare the MX 113 for installation remove the protective covering. Turn the MX 113 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 113. 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.

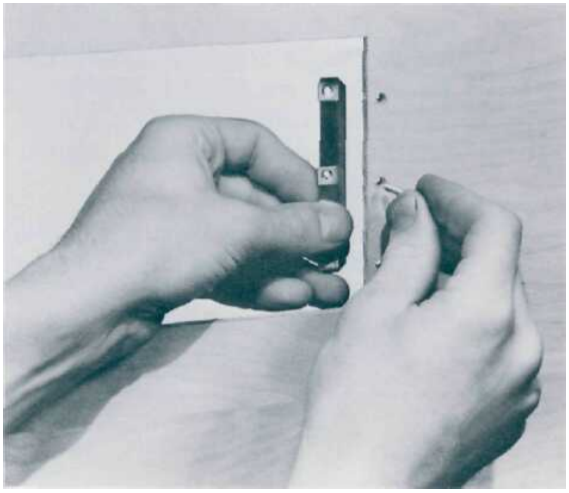
   Mark the two locating holes ("C" holes on the mounting template).

   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 cut-out area with a 3/16 inch drill.

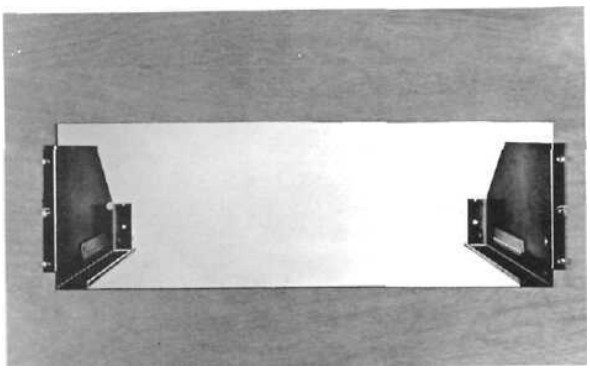
With the saw on the INSIDE OF THE PENCIL LINES carefully cut out the rectangular opening.

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 cabinet panel ("B" holes on the template) and tighten. The screw head should pull into the wood slightly. (Use two ¾ inch long screws for panels under ½ inch, or two 1¼ inch long screws for panels ½ 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 MX 113 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 corners of the front panel are the PANLOC buttons. Depressing the PANLOC buttons will lock the instrument firmly in the installation. Depressing the PANLOC buttons a second time 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 slide completely out of the installation.

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 input 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 113 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 source impedance at the MAIN OUTPUT is 200 ohms. Longer cables than supplied can be used between the MX 113 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

Satisfactory stereo where mono reception has been satisfactory requires about ten times as much signal from the antenna. Monophonic reception that is satisfactory on an indoor antenna may require the use of an outdoor antenna for stereo reception of equivalent quality.

With the MX 113 one of three antenna systems can be used: (1) the indoor dipole supplied with the MX 113, (2) an outdoor FM antenna, or (3) an all channel (UHF-VHF-FM) antenna. In fringe areas best results will probably be obtained with the use of an outdoor FM antenna. In many areas the indoor dipole may be satisfactory.

CONNECTING AN INDOOR DIPOLE ANTENNA

The flexible folded dipole antenna (300 ohm) supplied with the MX 113 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. Keep the antenna away from metal objects. Do not attach to a metal surface.

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 113 with coaxial cable. Connect the center conductor to the right FM ANT (red) connector. The shield is connected to the GND (black) connector.

CONNECTING AN AM ANTENNA

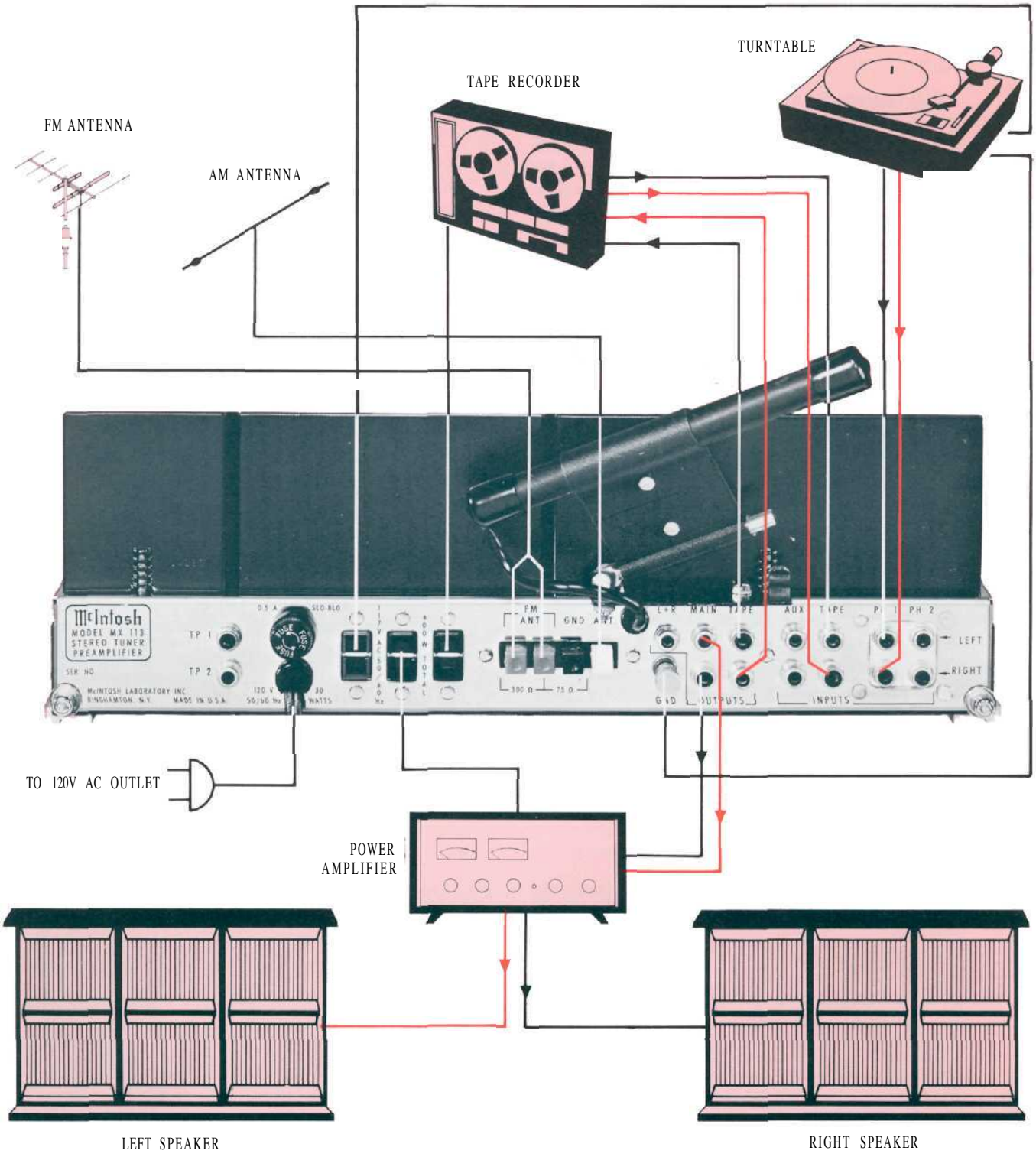
A high-quality loopstick antenna is provided. It can be rotated through nearly 180° in all directions for maximum performance, optimum signal reception or minimum interference. With this mobility you will not suffer loss of sensitivity regardless of the angle at which the instrument is mounted. A back panel antenna jack is provided for connecting an external antenna if desired.

AC POWER OUTLETS

There are two black AC power outlets, and one red AC power outlet. The AC 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 receptable 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 loosely twisted together. To avoid hum, make sure the ground wire does not make any contact to the shields of the left and right program cables between the program source and the MX 113.


TURNTABLE
TAPE RECORDER
FM ANTENNA
AM ANTENNA
McIntosh
MODEL MX 113
STEREO TUNER
PREAMPLIFIER
TP 1
TP 2
FM ANT
GND
AM ANT
L+R
MAIN TAPE
AUX
TAPE
PH 1
PH 2
LEFT
RIGHT
OUTPUTS
INPUTS
TO 120V AC OUTLET
POWER AMPLIFIER
LEFT SPEAKER
RIGHT SPEAKER

What the Controls Do and How to Use Them

INPUT SELECTOR

Select any one of five program sources:

AUX: Connects the output from any high level program source requiring flat amplification to the high level input stage. 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 113. 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 113 to the output jacks.

FM: Connects the FM tuner portion of the MX 113 to the output jacks.

PHONO 1: Connects the output of any magnetic phono cartridge to the low level input stage. The response of the low level stages has been shaped to conform to RIAA standards. The gam 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 outer knob controls the low frequency response in the right channel. The 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. Turn 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 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. Turn the control to the center position for flat response.

BALANCE/LOUDNESS

The BALANCE/LOUDNESS is a concentric control. The outer knob controls the balance between channels. The center knob is a switch that adds loudness compensation for low volume listening.

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 the 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 right accents the right channel by reducing the left channel output.

LOUDNESS

The LOUDNESS control automatically provides the correct amount of bass required to compensate for the change in response of the human ear at low-loudness levels.

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 pitch centered in the mid-tonal range. The LOUDNESS switch converts the volume control to a loudness compensated control. Use LOUDNESS-IN to listen at low volume and still hear full-frequency range.

VOLUME ON/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. When rotated to the counterclockwise position the AC power to the MX 113 is turned off.

Using the Pushbuttons

MODE SELECTOR

Stereo

With the pushbutton at the OUT position the left channel is heard from the left loudspeaker and the right channel is heard from the right loudspeaker.

Mono (L + R)

With the pushbutton at the IN position the left and right channels are added together and are heard from both loudspeakers.

LF FILTER

With the pushbutton at the IN position the low frequency response is attenuated below 50 Hz. The slope is 12 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 113 is flat.

HF FILTER

With the pushbutton at the IN position high frequency response is attenuated above 5000 Hz. The slope is 12 dB per octave. Use of the HF filter reduces unwanted high frequency noise like hiss or scratch. With the pushbutton released, the response of the MX 113 is flat.

TAPE

The TAPE pushbutton allows instantaneous comparison of recorded material and the program source. With the pushbutton at the IN position, the recorded tape is heard. With the pushbutton at the OUT position the program being recorded is heard.

IMPORTANT: When the MX 113 is operated with the TAPE pushbutton at the IN position, signal from any other source will not be heard from the loudspeakers. To hear any other program source, the pushbutton must be at the OUT position.

MUTING

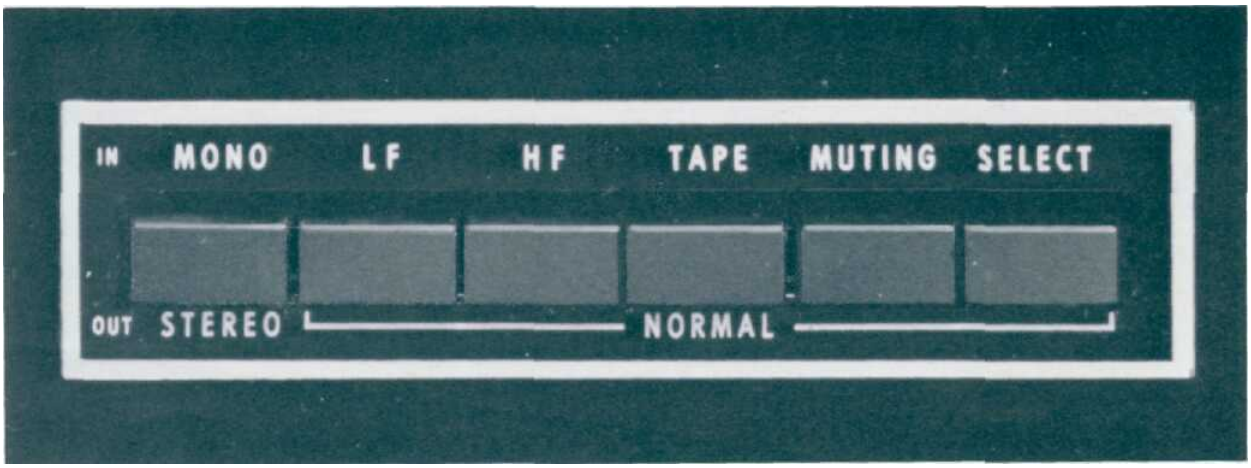
MUTING suppresses the background noise and hiss normally heard between FM stations. With the pushbutton at the IN position the muting is turned on. Weak stations that may not override noise and interference are also suppressed by the muting. With the pushbutton at the OUT position, the muting is turned off. This allows conventional FM tuning with the between station noise and interference present.

SELECT

With the SELECT pushbutton at the IN position the selectivity of the MX 113 is increased in both FM and AM. The sides of the IF curve are compressed which increases the ability of the tuner to separate a weak (distant) station from a strong (local) station on adjacent channels.

PANLOC

McIntosh developed PANLOC mounting brings professional installation technique to stereo. Depressing the PANLOC buttons will lock the instrument firmly in the installation. Depressing the PANLOC buttons a second time 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

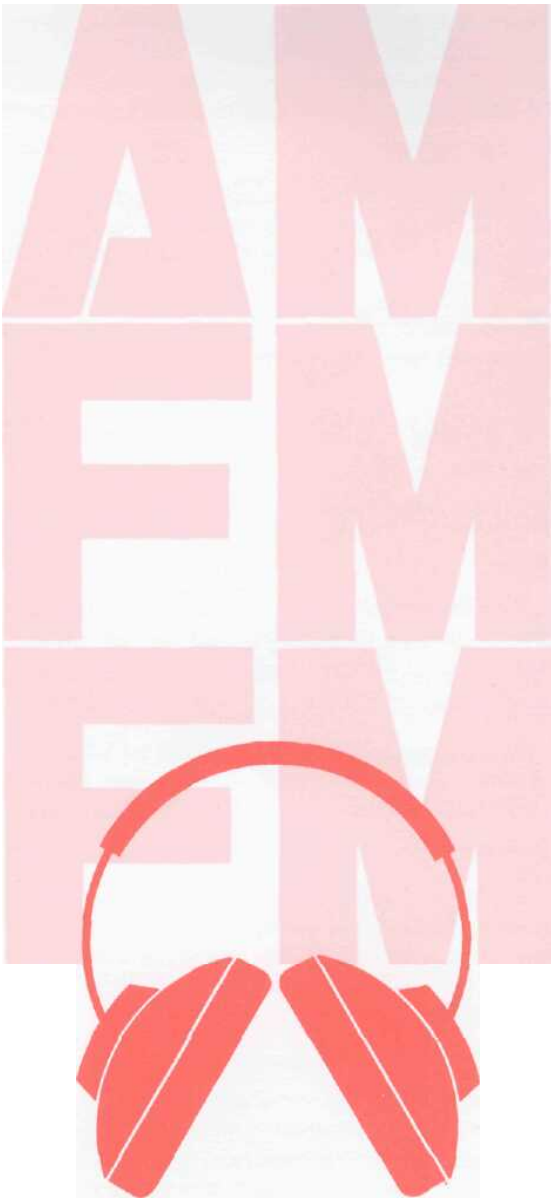
The performance and enjoyment of a stereo system is greatly increased when the sound is properly balanced. The balance of the stereo system is affected by many things including room acoustics, furniture placement, room shape, small differences in loudspeakers, etc. To assist you in balancing your stereo system in your room, here is the procedure to determine correct phase and program loudness.

TO ADJUST PHASE

1. Play a familiar record.
2. Press the MODE pushbutton to the MONO position.
3. Turn BALANCE control to 12 o'clock position.
4. 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 directly in front of you the speakers are in PHASE. Use the PHASE switch to correct for out of phase program sources.

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 satisfactory between both speakers.



Listening to Your Stereo

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.

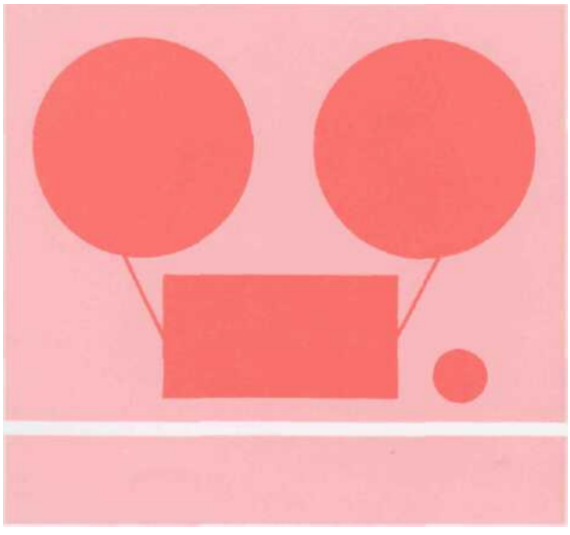
Set the MODE pushbutton to STEREO or MONO, depending on the program on the tape.

Adjust the VOLUME control to desired volume.

TO RECORD ON A STEREO TAPE RECORDER

All program sources are available at the TAPE OUTPUT jacks. The program material is unaffected by all front panel controls except the INPUT SELECTOR, and the use of the SELECT button on AM and FM.

To monitor while recording, the tape recorder must have separate record and playback or monitor heads. The TAPE pushbutton permits monitoring the tape recordings while in the process of recording. When the TAPE pushbutton is at 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 at the OUT position the program being recorded is heard.

LISTENING TO AM

Turn the INPUT SELECTOR to AM.

Rotate the tuning knob to the station of your choice.

Adjust the volume to a comfortable level.

Separation of a weak station from a strong adjacent station can be improved with the SELECT button at the IN position.

LISTENING TO FM OR FM STEREO

Turn the INPUT SELECTOR to FM.

Rotate the tuning knob to the station of your choice.

Separation of a weak station from a strong adjacent station can be improved with the SELECT button at the IN position.

When the STEREO indicator is lighted, the station is broadcasting a 19,000 Hz pilot signal for stereo and the MX 113 will automatically switch to stereo. If a station is not transmitting the 19,000 Hz pilot signal for stereo, the STEREO indicator will remain off and the tuner will automatically switch to mono. The MX 113 uses a new McIntosh developed automatic mono-stereo switching circuit. The circuit action is electronic and prevents switching clicks or transients.

The ultrasonic muting circiut suppresses all noise between FM stations. It also 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. Casual adjustment of the muting threshold is not recommended.

While tuning FM you may notice that the tuning meter 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.

The ability to separate a weak station from a strong station will be improved by the use of the SELECT pushbutton. With the pushbutton at the IN position a McIntosh developed circuit compresses the sides of the IF curve which improves the separation of weak stations from strong stations on adjacent channels.

Performance Limits and Ratings

Performance limits are the maximum deviation from perfection permitted for a McIntosh instrument. We promise you that the MX 113 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.

FM

USEABLE SENSITIVITY
2.5 microvolts at 100% modulation (±75 kHz deviation) for less than 3% total noise and harmonic distortion

SIGNAL TO NOISE RATIO
70 dB at 100% modulation

HARMONIC DISTORTION
Mono: 0.3% at 100% modulation ±75 kHz deviation
Stereo: 0.5% at 100% modulation ±75 kHz deviation

FREQUENCY RESPONSE
±1dB from 20 Hz to 15,000 Hz with standard de-emphasis

CAPTURE RATIO
1.5 dB

SPURIOUS REJECTION
90 dB IHF

IMAGE REJECTION
95 dB; 88 to 108 MHz (IHF)

STEREO SEPARATION
35 dB at 1000 Hz

SELECTIVITY
Adjacent Channel—6 dB IHF with SELECT button in normal; 15 dB IHF with SELECT button at the IN position
Alternate Channel—58 dB IHF with SELECT button in normal; 88 dB IHF with SELECT button at the IN position

TUNING INDICATOR
D'Arsonval movement meter

STEREO INDICATOR
Stereo light activated by 19,000 Hz pilot signal only

AM

SENSITIVITY
75 microvolts at 1,000 kHz (using external antenna input)

SIGNAL TO NOISE RATIO
45 dB

HARMONIC DISTORTION
1% at 30% modulation

FREQUENCY RESPONSE
Down 6 dB at 3,500 Hz

ADJACENT CHANNEL SELECTIVITY
35 dB with SELECT button at the OUT position
45 dB with SELECT button at the IN position

IMAGE REJECTION
65 dB; 540 kHz to 1600 kHz

PREAMPLIFIER

FREQUENCY RESPONSE
±0.5 dB, 20 to 20,000 Hz

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

INPUT SENSITIVITY
PHONO 1 and PHONO 2: 2 millivolts for 2.5 volts output at 1,000 Hz
AUX and TAPE: 0.25 volts for 2.5 volts output

INPUT IMPEDANCE
PHONO 1 and PHONO 2: 47,000 ohms
AUX and TAPE: 250,000 ohms

VOLTAGE AMPLIFICATION
PHONO 1, PHONO 2 to MAIN output 62 dB, to TAPE output 42 dB
AUX and TAPE to MAIN output 20 dB; to TAPE output 0dB

HUM AND NOISE
PHONO 1 and PHONO 2: 72 dB below 10 millivolt input; equivalent to less than 3 microvolts at the input terminals.
AUX and TAPE; 85 dB below 2.5 volts output, unweighted

BASS CONTROL
-18 dB to +16 dB at 20 Hz

TREBLE CONTROL
±20 dB at 20,000 Hz

LF FILTER
Flat or roll off below 50 Hz, down 12 dB at 20 Hz

HF FILTER
Flat or roll off above 5,000Hz, down 12 dB at 20,000 Hz

OUTPUT
Main: 2.5 volts with rated input. Up to 10 volts can be developed without increase in distortion. FM and AM will produce 10 volts output at 100% modulation.

Tape: 0.25 volts with rated input. Phono input signal of

10 millivolts produces 1.2 volts output. FM and will produce 1.2 volts output at 100% modulation.

L + R: 2 volts with rated input

GENERAL

TRANSISTOR COMPLEMENT

2-JFET
3—MOSFET
30—Silicon Planar
31—Diodes
2 Integrated Circuits—(each contains the equivalent of 16 transistors and 8 diodes)

POWER REQUIREMENTS

120 volts, 50/60 Hz, 30 watts

FACILITIES AND FEATURES

VOLUME CONTROL: Precision "tracked" at all listening levels. (0 to -65 dB). Does not change stereo balance as loudness is changed. The AC power ON/OFF switch is coupled with this control.

BALANCE CONTROL: Natural balance at center position, attenuation of left or right channel by rotating control.

LOUDNESS: Loudness compensated or fat response—Loudness position boosts low frequencies for low level listening. Operates as a function of volume control position. Full compensation is obtained at lower volume levels and flat response is obtained at full volume.

SELECTIVITY: Increases the ability of the tuner to separate a weak (distant) station from a strong (local) station on adjacent channels.

MUTING: Suppresses the background noise and hiss normally heard between FM stations.

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

MODE: Selects either stereo or mono operation.

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

MUTING ADJUST: Modifies the noise rejection threshold on FM

DIAL SCALE INTENSITY: Modifies the brightness of the illumination of the front panel

MECHANICAL

SIZE: Front panel: 16 inches wide (40.64 cm) by 5-7/16 inches high (13.81 cm); Chassis: 15 inches wide (38.1 cm) by 13 inches deep (33.02 cm), including PANLOC shelf and back panel connectors; Knob Clearance: 1½ inches (3.81 cm) in front of mounting panel.

WEIGHT: 26 pounds (11.79 kg) net, 38 pounds (17.24 kg) in shipping carton.

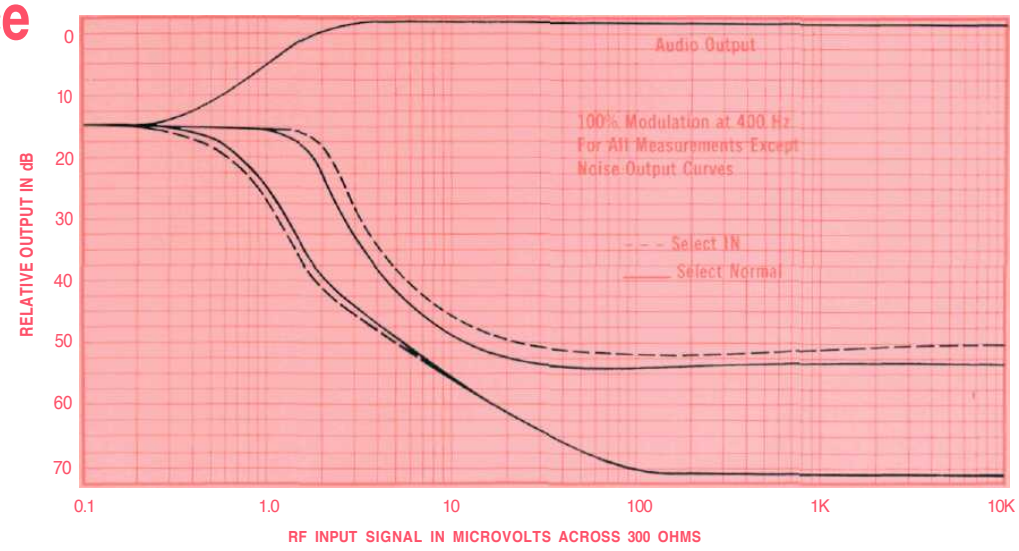
FINISH: Front panel: Anodized gold and black with special gold/teal panel nomenclature illumination.

CHASSIS: Chrome and black.

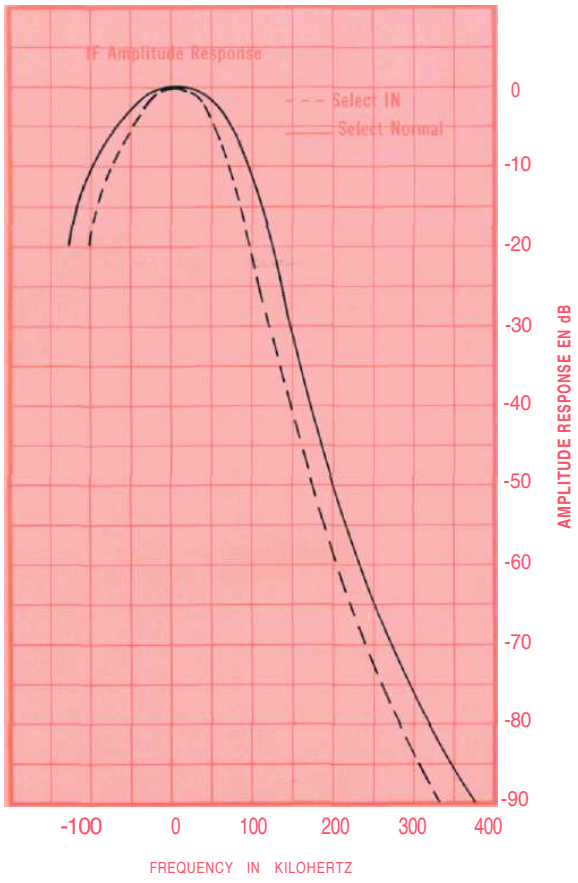
MOUNTING: McIntosh developed professional PANLOC.

Performance Charts

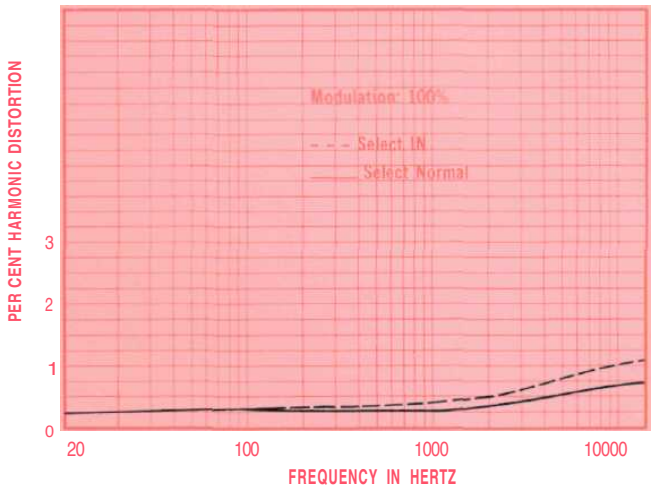
FM SIGNAL PERFORMANCE



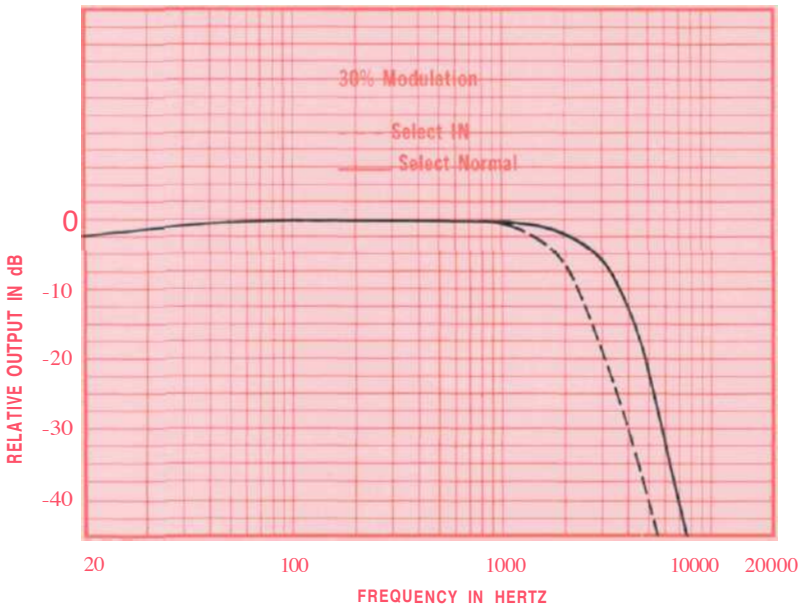
FM-IF CHARACTERISTIC



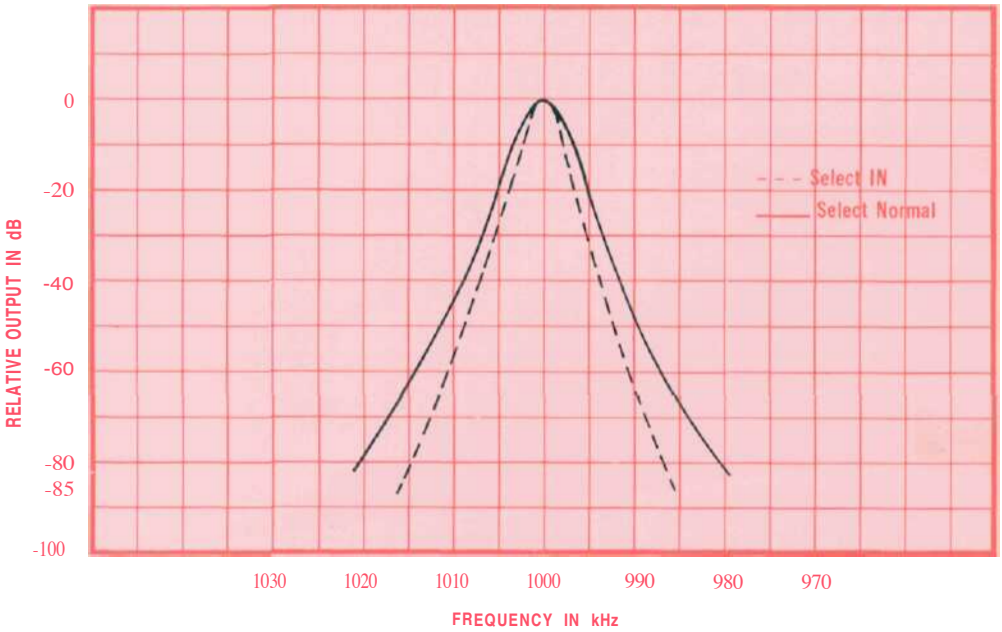
FM HARMONIC DISTORTION



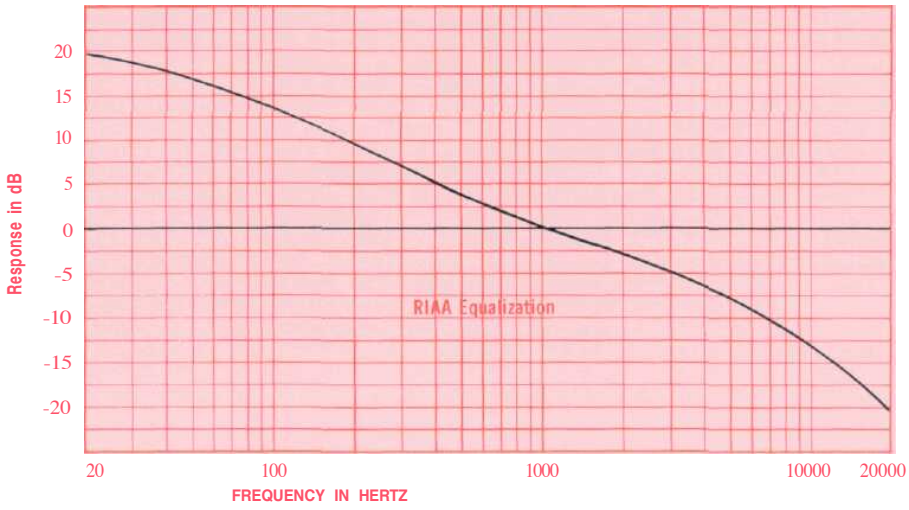
AM FREQUENCY RESPONSE



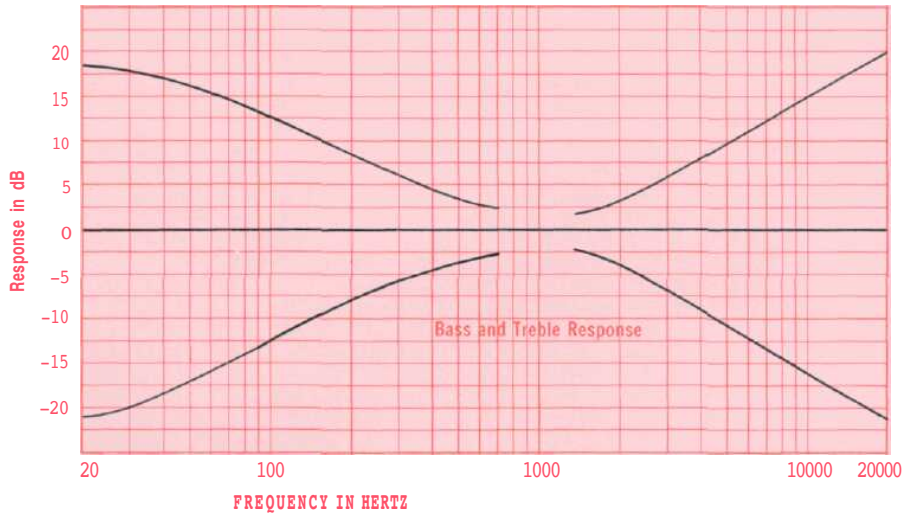
AM SELECTIVITY AT 1000 kHz



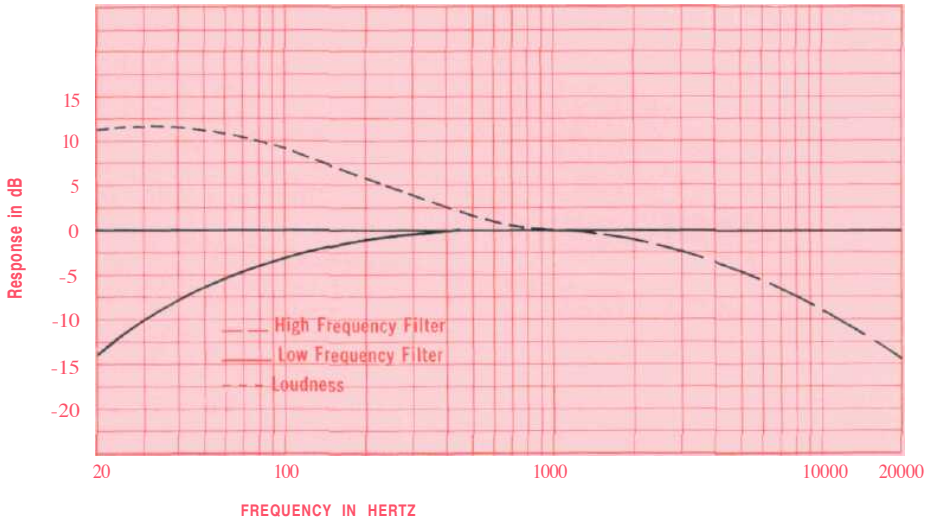
PHONO EQUALIZATION



TONE CONTROLS



LOUDNESS AND FILTER CHARACTERISTICS



Technical Description

TUNING MECHANISM AND DIAL DRIVE

In the MX 113, the unique design and careful manufacture of the mechanical 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.

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

FM SECTION

The Radio Frequency (RF) section houses the complete FM-RF front-end and part of the AM RF circuit.

A seven-section variable capacitor is the heart of the RF section. Four sections of the variable capacitor are in the FM front end and the remaining three are in the AM section. By interleaving the sections (AM-FM-AM-FM-etc.) spurious responses are significantly reduced. The four FM sections of the variable tuning capacitor provides a high degree of RF selectivity and excellent spurious rejection. Using the latest "state of the art" field effect transistors with a well-designed variable tuning capacitor has provided the MX 113 with an excellent RF front-end.

A dual insulated gate metal oxide silicon field effect transistor (MOS-FET) is used as first and second RF amplifier. Each gate of the transistor is internally protected by back-to-back diodes against incoming transients that may occur due to severe external conditions. Use of MOS-FET's greatly reduces the cross-modulation products over a wider dynamic range. A wider dynamic range permits the input circuits to accept extremely strong signals without overload. Since both RF amplifiers have insulated gate configurations, external neutralization is not required. This design results in a very stable RF amplifier circuit.

Low temperature coefficient components for the FM local oscillator prevent frequency drift. The frequency stability inherent in the local oscillator makes automatic frequency control (AFC) unnecessary. The rate of drift of the local oscillator is less than ten parts per million per degree centrigrade.

The mixer design uses a JFET for high sensitivity and freedom from overload. The mixer delivers the composite FM signal at the 10.7 MHz intermediate frequency. The path of the IF signal is controlled by the front panel SELECTivity pushbutton.

At the OUT position, the SELECTivity switch directs the signal through an IF preamplifier stage, that uses a J-FET and a double-tuned IF transformer. The signal then goes to the FM-IF and discriminator module for further amplification. Activating the SELECTivity pushbutton routes the signal to two double-tuned transformers, a ceramic filter network, and a single-gate MOS-FET. The sides of the IF curve are compressed by this circuit narrowing the IF bandpass. In this mode of operation weak stations adjacent to strong stations can be tuned with surprising clarity.

All of the RF circuits, including the selectivity circuit and the AM sections of the variable capacitor are encased in a metal module. Each FM-RF section is isolated in a separate compartment by metal shielding. Careful design and manufacturing increase the protection against radiation and interference. The MX 113 exceeds the FCC requirements for suppression of local oscillator radiation.

Antenna connections for either 300 ohm twin lead transmission line or 75 ohm coaxial cable are provided on the back panel of the MX 113. The normal input impedance of the RF amplifier is 75 ohms. Impedance match to 300 ohms is provided by a McIntosh designed, negligible loss, balun transformer. Connections for both 300 ohm twin lead and 75 ohm coaxial cable are made with push type terminals.

FM-IF AND DISCRIMINATOR SECTION

The MX 113 uses linear-phase IF filters. Each filter was designed from a FORTRAN computer program for minimum-phase and constant delay. The mathematical complexity of the filter design procedure is almost beyond belief. Using numerical integration in the S-Plane, an "IBM" 1130 high speed computer spent eighteen minutes on the mathematics for the design of the IF filter. It would have taken a human engineer, working twenty-four hours a day, seven days a week, and working error-free three-hundred years to perform the same mathematical calculations!

The IF filter has equal time delay in its pass band region. Any error in time delay causes FM distortion. All other IF filters have delay distortion, some as much as 100% of the 10.7 MHz transit delay. The MX 113 has less than 1.0% delay distortion from antenna input to discriminator output! This makes possible the overall low distortion performance limit for the FM tuner and multiplex section of the MX 113.

Amplification of the intermediate frequency signal is provided by two high gain integrated circuits, each containing 16 transistors, 3 zener diodes, 5 diodes, and 23 resistors, all on a signal monolithic silicon chip. The exceptionally high gain of the integrated circuit assures "hard limiting" at very low levels of input signals.

Paralleling the main signal path through the FM-IF and detector module, a secondary amplifying and de-modulating process is used to activate the tuning meter and to provide testpoint TP1 and TP2 with a signal to be used with the McIntosh Maximum Performance Indicator.

FM STEREO MULTIPLEX SECTION

McIntosh has developed a special detecting circuit used in the multiplex section. A particular advantage of this circuit is the elimination of the critical adjustments necessary with commonly used matrixing circuits. The circuit detects the L - R sidebands, then automatically matrixes

the recovered information with the L + R carrier signal. This yields the left and right program output with maximum separation.

The 19,000 Hz pilot signal, broadcast by an FM station, 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. The new combination of signals is fed to the special detector circuit mentioned above. Balanced full wave detectors are used to cancel the 38,000 Hz components in the output. The SCA (Subsidiary Communication Authorization) signal must be removed from the composite output. This is accomplished by the use of a new "Image Parameter" band elimination filter that has been computer designed. The SCA filter rejects SCA signals without impairing stereo performance.

When the 19,000 Hz carrier of a stereo signal is received, the automatic FM stereo switching circuit activates the multiplex decoding circuit. This lights the stereo indicator. The circuit switching is all done electronically with no clicks. The automatic stereo switching can be defeated by depressing the mode selector switch to MONO. (In this position the stereo indicator will still light to indicate the presence of a stereo signal.) On monophonic transmissions the stereo switching is inactive at all times, assuring optimum signal to noise ratio. The stereo switching circuit has been designed so that noise will not activate it.

FM muting in the MX 113 operates by detecting ultrasonic noise which is present when tuning between stations or when receiving a weak station. The muting circuit can be activated or defeated by the use of the muting button on the front panel. The threshold of muting desired can be adjusted by the muting level control on the top panel. Varying the muting control adjusts the threshold at which the muting takes effect.

AM SECTION

The AM-RF amplifier circuit includes a three section variable tuning capacitor in the metal enclosed shielded RF module which also houses the FM-RF front end. A three section variable capacitor is used for greater spurious rejection. The RF amplifier is unique. The circuit has constant sensitivity, constant selectivity, high image rejection across the complete AM band. Ordinary AM-RF circuits cannot do all of these simultaneously. This circuit design achieves equal sensitivity even at the low end of the band. Spurious, image, and intermediate frequency rejection are all superior. The same circuit delivers equal selectivity across the entire band. The McIntosh circuit is unique in a superheterodyne AM receiver.

In addition, there is no loss of audio frequency response at the low end of the band, common in AM receivers. Another advantage of the McIntosh circuit is freedom from cross-modulation and overloading by strong local stations.

A high-quality loopstick antenna is provided. It can be rotated for maximum performance, optimum signal reception or minimum interference. In each MX 113 the loopsticks are individually tuned for optimum performance. After tuning, the loopstick is then sealed. This custom matching of the loopstick to the AM-RF front end maximizes the performance of the loopstick antenna. The antenna is rotatable through nearly 180 degrees in all directions. With this mobility you will not suffer loss of sensitivity regardless of the angle at which the instrument is mounted. A back panel antenna connector is provided for connecting an external antenna if desired.

To maintain the excellent image rejection and lack of spurious cross modulation of the AM-RF amplifier an autodyne converter circuit was used in producing the AM-IF.

AM-IF uses two double tuned IF transformers designed to obtain a high degree of selectivity yet allowing good audio fidelity. With the SELECT button IN a narrow band ceramic filter is added between the AM-IF amplifier and the detector.

A 10,000 Hz active filter eliminates the 10,000 Hz whistle and irritating "Monkey Chatter" caused by an adjacent station. The frequency response of all stations is nearly flat from 20 Hz to around 3,500 Hz, then rolloff begins. Because an active filter is used, the output level at 10,000 Hz, or the whistle frequency, is down over 20 dB or one hundredth of what it would be without filtering. With the select button IN, the active filter cutoff frequency is lowered. The filter then effectively suppresses the 5,000 Hz whistle from nearby television receivers.

The AVC (automatic volume control) system was designed to prevent bursting or thumps when the AM is tuned through a strong signal. Distortion at low audio frequencies is minimized by using two AVC filter sections instead of the conventional one.

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 compenation 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 one of two high level inputs (TAPE or AUX) to the main preamplifier. The input impedance of the high level input is 250,000 ohms. The high level inputs feed

directly to the volume control. A loudness 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. 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.

In the left channel the second transistor is connected in a balanced output arrangement. This circuit provides equal amplitude signals but of opposite phase for the phase switch.

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 useable program material to a minimum.

The output from the filter circuits is fed to 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 of the tone-control response curves. Negative feedback is maintained at all frequencies, even with tone controls turned to full boost. Overall distortion is low at all frequencies including frequenices where maximum boost occurs. The negative feedback also provides the low impedance output required for the main preamplifier outputs.

L + R AMPLIFIER

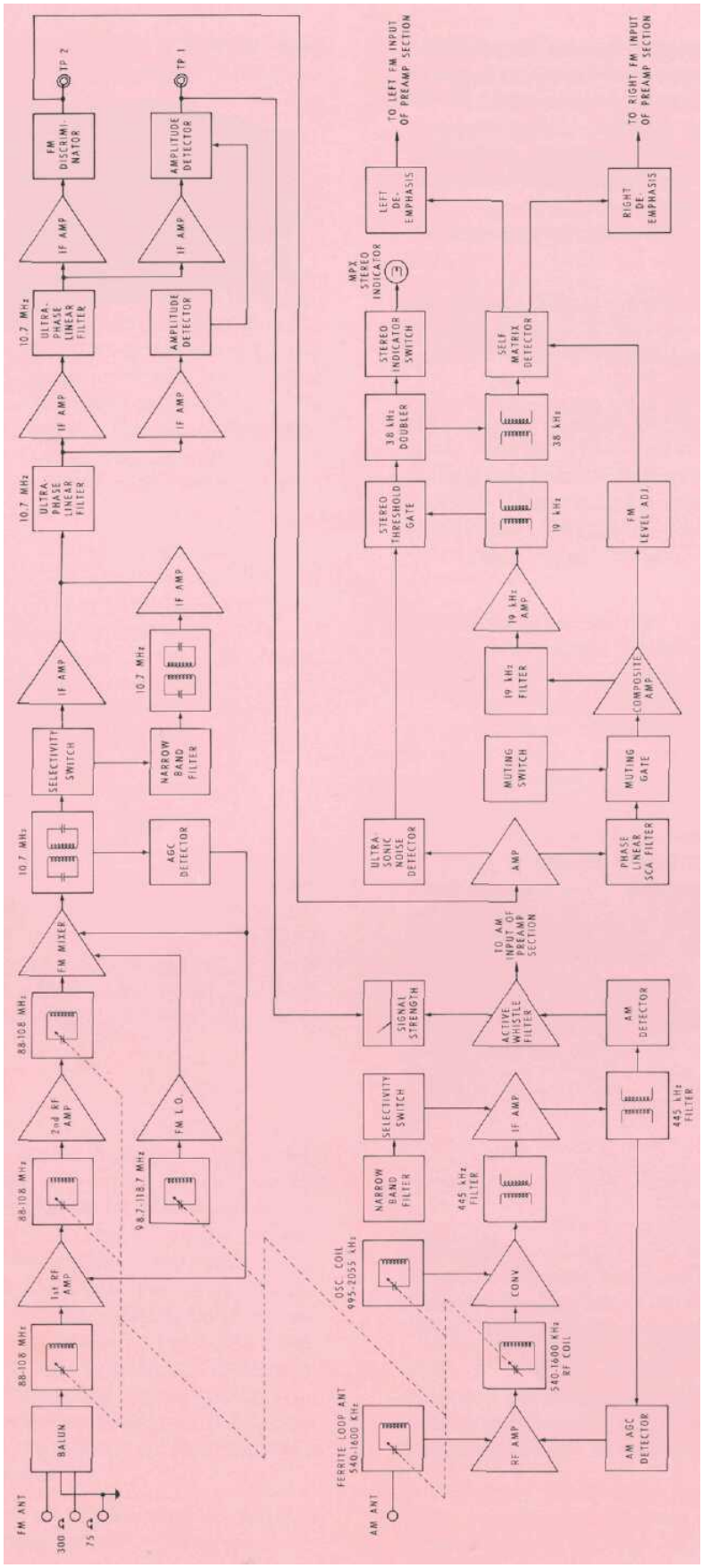
The L + R amplifier consists of a single transistor connected as a voltage amplifier. Negative feedback is used around the summing amplifier to maintain low distortion and provide a low impedance for the center channel output.

POWER SUPPLY

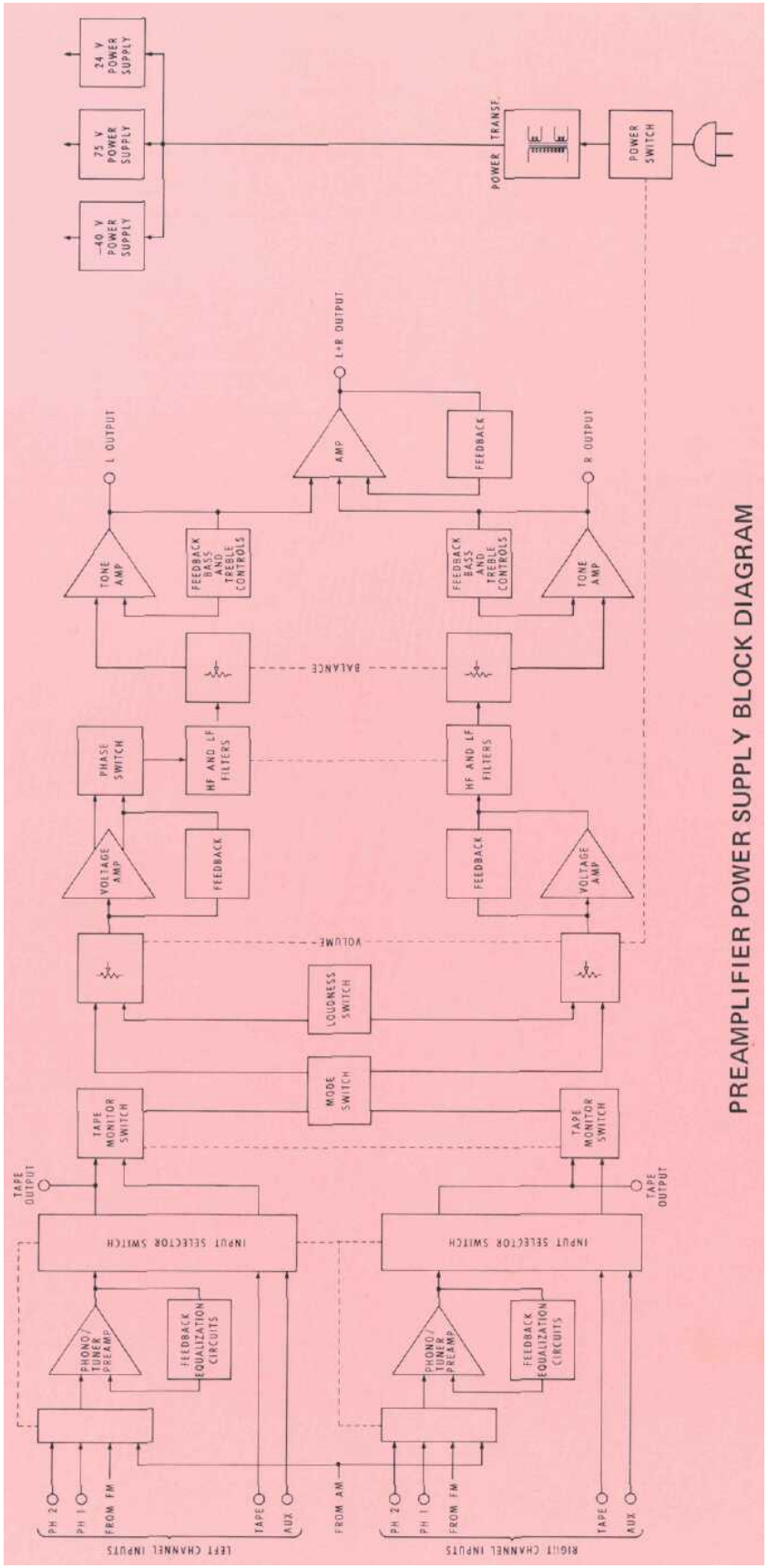
The power supply of the MX 113 has received very special attention.

Three separate rectifier circuits are used. First, a full-wave rectifier supplies DC to all audio circuits. The second full-wave rectifier supplied DC to all tuner and multiplex-decoder circuits. The third supply provides DC to the AM circuit.

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



FM-AM BLOCK DIAGRAM


PREAMPLIFIER POWER SUPPLY BLOCK DIAGRAM
24 V POWER SUPPLY
25 V POWER SUPPLY
-40 V POWER SUPPLY
POWER TRANSF.
POWER SWITCH
L+R OUTPUT
AMP
FEEDBACK
L OUTPUT
R OUTPUT
TONE AMP
FEEDBACK BASS AND TREBLE CONTROLS
BALANCE
PHASE SWITCH
HF AND LF FILTERS
VOLTAGE AMP
FEEDBACK
VOLUME
LOUDNESS SWITCH
MODE SWITCH
TAPE MONITOR SWITCH
TAPE OUTPUT
INPUT SELECTOR SWITCH
PHONO/TUNER PREAMP
FEEDBACK EQUALIZATION CIRCUITS
PH 2
PH 1
FROM FM
TAPE
AUX
FROM AM
LEFT CHANNEL INPUTS
RIGHT CHANNEL INPUTS

STATION LOG

CALL LETTERS	FREQUENCY	LOCATION	ANTENNA DIRECTION

CALL LETTERS	FREQUENCY	LOCATION	ANTENNA DIRECTION

McINTOSH

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