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McIntosh

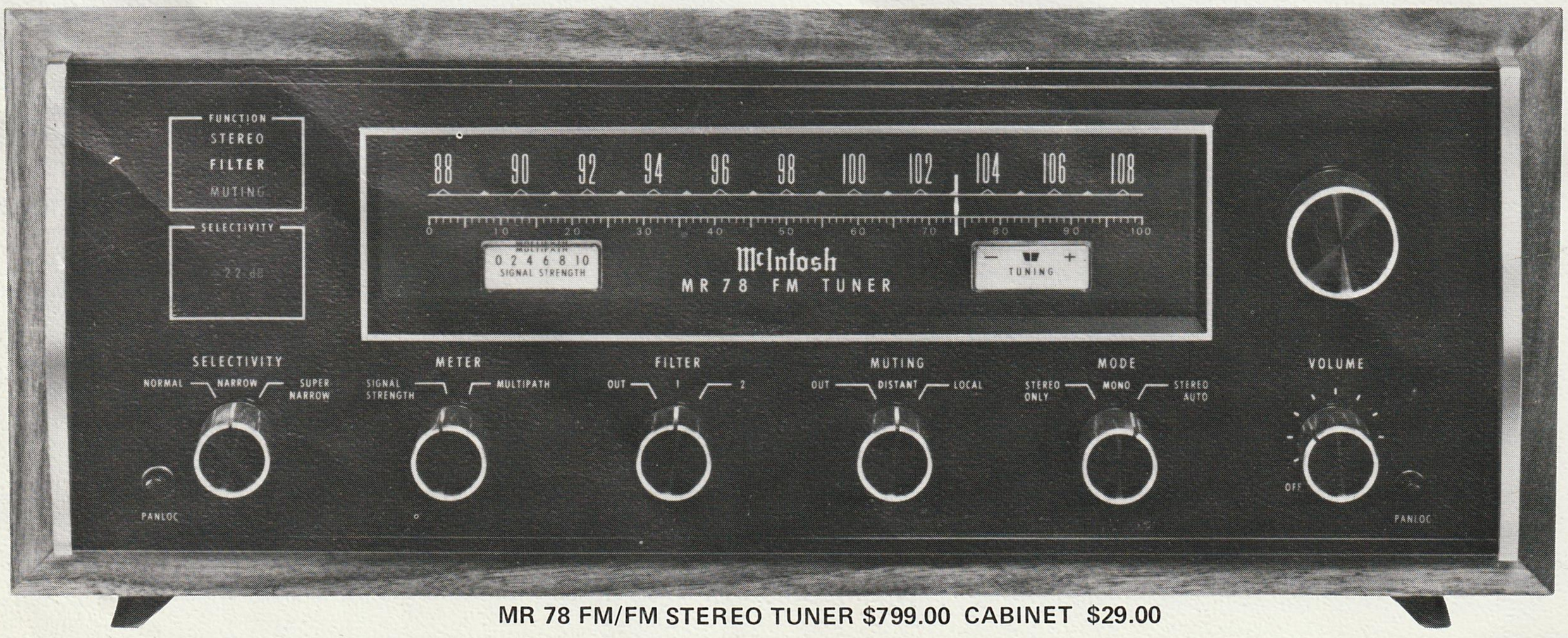
THE ULTIMATE FM TUNER

MR78

The McIntosh MR 78 (FM/FM stereo) is a tuner that even breaks McIntosh performance records. McIntosh units such as the MR 74, MR 77, MX 113, MX 115 have bettered the performance of all other tuners available today. Yet with the MR 78 an outstanding improvement above these is acheived. This unit has the lowest distortion and greatest selectivity characteristics ever combined in a tuner and is the culmination of eight man years of serious development work.

This beautifully styled unit has so many superlative performance characteristics that only some of the major ones will be mentioned because of space limitation.

- Multiple selectivity three levels – normal, narrow, and super narrow can be selected from the front panel by means of diodes using "DC" switching which is an ideal way to handle a difficult RF problem. A two position RF selectivity diode switching circuit for low and high gain antennas adds a useful parameter that is unique.
- Patented constant delay IF filter system greatly reduces distortion while providing the utmost selectivity. Two eight-pole filters are selectable as well as a four pole multi element crystal in the super narrow position.
- An ultra phase linear bridge discriminator provides distortionless conversion from FM to audio and exhibits a capture ratio close to 0 dB. No active elements are used there by providing a "breakthrough" and "driftless" ideal detector.
- 5 element tuning condenser improves R.F. front end behavior; more tuned circuits for better selectivity. Silver plated chassis and R.F. coils for better shielding lower losses and higher Q circuits.
- Tremendous accommodation of strong input signals up to 12 volts - overcoming one of the most aggravation limitations of tuners that occur when very strong signals are present.
- Highest spurious rejection 100 dB IHF and highest image rejection 100 dB (88 to 108 MHz). This means you don't receive the same stations or a mixture of them as you tune across the dial where they are not wanted.
- Ultra Sonic 'muting' provides smooth inter channel FM noise suppression.
- Has test points TP 1 and TP 2 for connection to McIntosh Maximum Performance Indicator MPI 4 for the sophisticated listener.
- McIntosh developed a special detecting circuit used in the multiplex section. An 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 the maximum separation.
- Uses a balanced mixer and coupling transformer circuit for low intermodulation effects.
- See the specifications list on the back page for many other outstanding characteristics of this remarkable unit.



MR 78 FM/FM STEREO TUNER $799.00 CABINET $29.00

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THE FINEST TUNER IN THE WORLD TODAY, LOWEST DISTORTION! HIGHEST SELECTIVITY!

Front End

FM signals enter the tuner through the antenna terminals. A coaxial cable conducts the signal to the RF amplifier. In the amplifier the stations are separated, amplified, and converted to a common 10.7 MHz IF frequency. Instead of using a conventional easily overloaded transistor or FET as a straight RF amplifier, the MR 78 uses a rugged Junction Field Effect Transistor as an impedance converter to drive a 5-watt power transistor. This combination (a cascode circuit) makes the RF amplifier virtually impossible to overload or cross-modualte. As an example, if you are tuned to a 3 microvolt signal at 96.3 MHz, the MR 78 will reject signals elsewhere on the dial which are at least 4,000,000 times stronger. Thus, a 12 volt signal received at 104.3 MHz would not bother the signal at 96.3 MHz. When tuned to 104.3 MHz, the tuner will not overload. All MR 78 tuners must pass the 12 volt overload test.

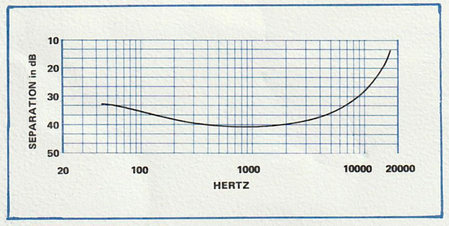
Another new design in the MR 78 front end is the integrated circuit balanced mixer. This mixer is practically impossible to overload. Oscillator pulling, cross modualtion, and other types of distortion so common in ordinary transistor or FET mixers is minimized. A balanced bifilar transformer couples the 10.7 MHz output to the IF amplifier.

Completing the MR 78 front end is the oscillator. It uses a high-Q ceramic form tank coil. The oscillator is free from spurious radiations, and operates at high efficiency. Due to its high stability AFC and its attendant limitations are avoided.

Stereo Decoder

An integrated circuit audio amplifier with over 120 dB of negative feedback in two loops is used to drive the stereo demodulator. This new circuit keeps the distortion low in the stereo mode of operation. Highly stable pilot recovery circuits are used to minimize 19,000 Hz intermodulation beats. MUTING, STEREO ONLY, and AUTOMATIC STEREO/MONO switching are functions performed within the stereo decoder.

The STEREO FILTER is connected in the audio amplifier to reduce noise when listening to weak stereo stations. Careful design of the STEREO FILTER circuit permits an ideal compromise between channel separation and noise rejection.



Linear Phase Bridge Discriminator

The excellence of the IF filter would be diminished if it had to work into an ordinary FM detector. Thus a new detector with suitably low distortion was developed. A search of the available literature revealed a little-known bridge circuit with a theoretical distortion of zero! However, designing a practical working circuit for a commercially feasible stereo tuner took some doing. A U.S. patent has been awarded and is exclusively for McIntosh owners.

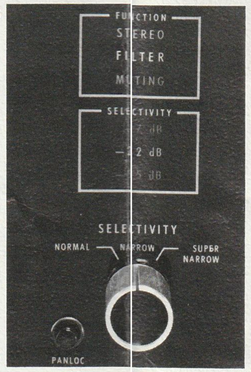
Distortion performance of the bridge detector is pretty close to the theoretical zero. In addition to its excellent distortion performance, the bridge detector itself also exhibits capture ratio close to 0 dB.

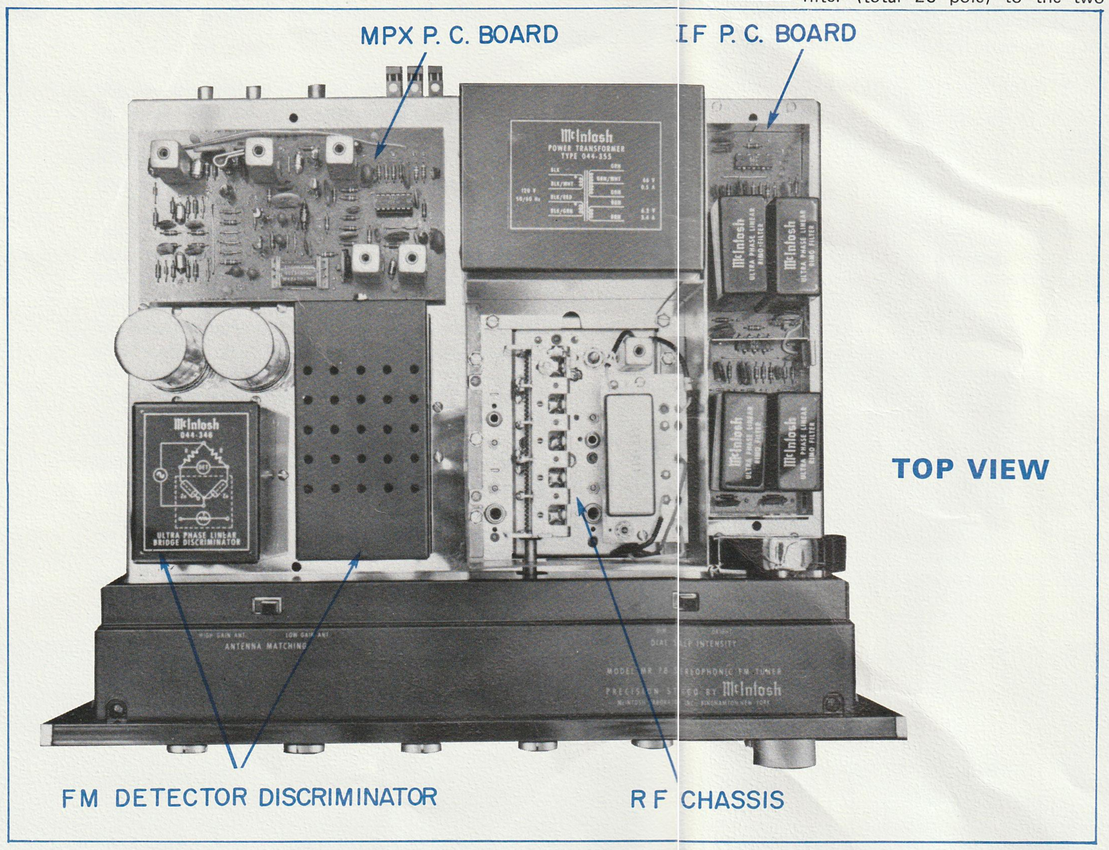
Rimo Filter IF Amplifier

The MR 78 uses linear-phase IF filters. The Rimo filter, designed from a FORTRAN computer program, is the most general class of minimum-phase constant-delay filter. The filter design has great mathematical complexity. 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 an 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 Rimo filter has flat time delay in its pass band region. Any error in time delay causes FM distortion. All other IF filters have delay distortion, as much as 100%. The MR 78 filter has less than 1.0% delay distortion from antenna input to discriminator output.

Constant delay in the IF filter bandpass (which is equivalent to linear phase) is essential for low distortion FM reception. The MR 78 tuner uses linear phase (Rimo) filters at NORMAL and NARROW positions of the SELECTIVITY switch settings.





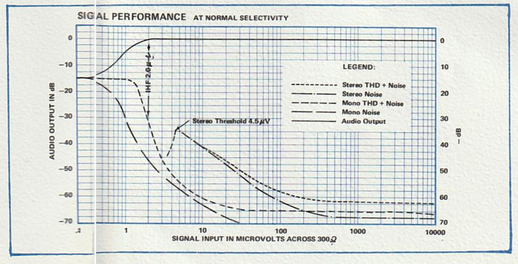
New Three Position Selectivity

The MR 78 has excellent selectivity. The bandwidth (210 kHz wide at 60 dB down) permits tuning in stations that are impossible on ordinary tuners. Even though the MR 78 has the narrowest IF bandwidth ever used in a stereo tuner, (it is the correct width to let just one FM station through) the great number of stations crowding the FM band requires a tuner with variable selectivity.

Variable selectivity allows stereo reception even under severe receiving conditions. In the NORMAL position, a very low distortion 8-pole filter is used in the IF circuit for listening to local broadcasts.

The NARROW position adds a sharp 8-pole filter to the NORMAL IF filter to yield a low distortion (less than 0.2%), highly selective 16-pole composite IF filter. In the NARROW position interference is reduced while receiving distant stations.

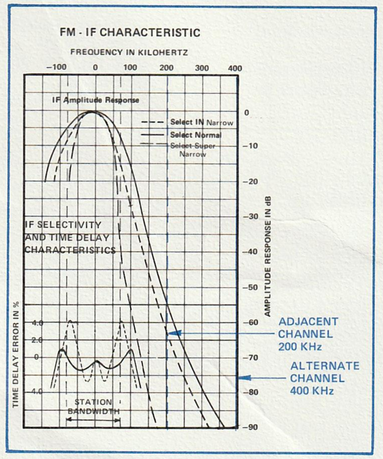
SUPER-NARROW position adds a 4-pole 4-zero crystal filter (total 20 pole) to the two other IF filters. SUPER NARROW permits receiving distant stations which are on channels adjacent to local stations. With an adequate FM antenna there are usable signals never heard before with any other FM tuners.

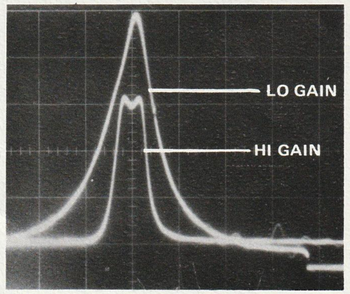


Antenna Matching

The MR 78 has an antenna matching circuit in the RF input. In fringe areas a broad low-loss RF circuit provides maximum sensitivity for a low-gain antenna. In metropolitan areas crowded with many strong signals, a sharp RF input circuit greatly reduces spurious responses and achieves maximum sensitivity when connected to a high-gain antenna.

The RF bandpass of the antenna matching circuit can be modified by switching a resonator in or out of the circuit. Broad bandpass is obtained by setting the ANTENNA MATCHING switch to the LOW GAIN ANTENNA position.





Sharp bandpass is obtained by setting the ANTENNA MATCHING switch to the HIGH GAIN ANT. position. The RF input circuit becomes a double tuned filter with high Q in both resonators, which provides sharp bandpass. The oscillograph photo shows the two bandpass curves of the RF input circuit.

Why You Should Own McIntosh

- McIntosh equipment is and has been the World Standard of the finest since the company was started 25 years ago.
- McIntosh is the only pioneer company in this field still under the same ownership and management. It is still dedicated to the best possible value.
- McIntosh conducts about 200 audio clinics a year in retail locations, where gain - frequency - distortion characteristics are made on submitted customer equipment. About 15,000 amplifiers and preamplifiers are measured per year. After eleven years we've accumulated an extensive appraisal of our own equipment and, of course, of equipment made by others.
- McIntosh equipment has been so made and maintained that almost all of it is still in use. Some of it is twenty-four years old and still meeting its original exacting specifications of our earliest production.
- McIntosh equipment enjoys the highest resale value by far of any equipment in this field. It remains on the "Used Equipment" shelf less time than perhaps any other. This fact assures maximum return on investment when McIntosh customers up-grade their equipment.
- McIntosh dedication to fundamentals and solid improvement has justified many patents on its equipment — not tricks or gadgets.
- McIntosh customers indicate that we should continue this quality theme without compromise, and to continue our concern for the customer after the sale is made.
- The McIntosh investment in professional testing instruments is staggering. On a percentage basis McIntosh probably invests more of its sales dollars in testing facilities than anyone else in a like business. As new testing instruments are produced that update the McIntosh ability to know, McIntosh invests in them — wave form analyzers — real time analyzers — low distortion signal generators. "What does this mean to me?" you ask. Only through this impressive investment; through continuous research; through product analysis; and endless measurement can we promise and deliver to you reliability, long life, performance, highest value, and freedom from service.

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Rear View

MR 78 — Performance Limits (Best in the World)!

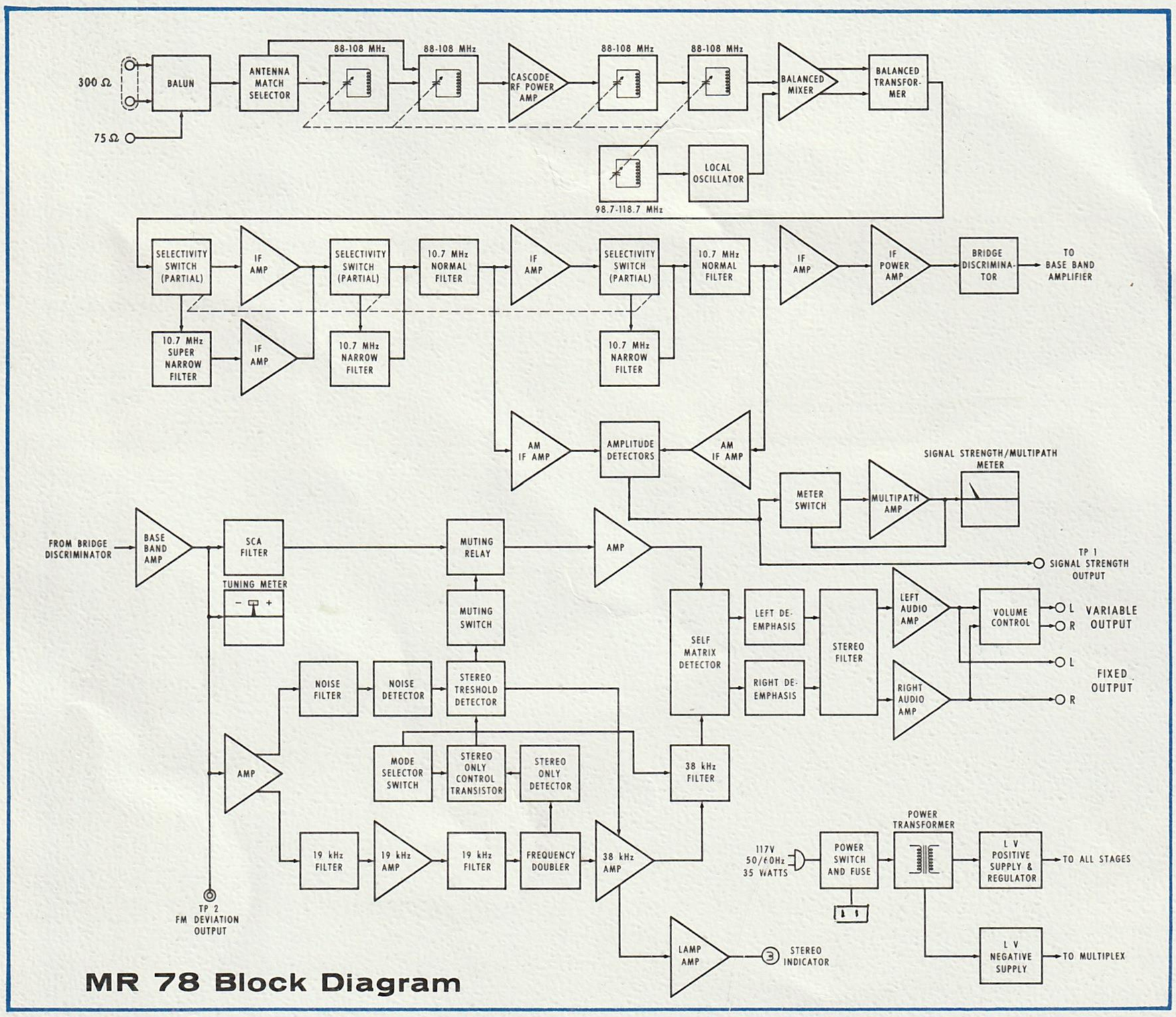
PERFORMANCE GUARANTEE - Performance limits are the maximum deviation from perfection permitted for a McIntosh instrument. We promise you that the MR 78 you buy must be capable of performance at or exceeding these limits or you get your money back. McIntosh is the only manufacturer that makes this guarantee.

TUNING RANGE: 88 to 108 MHz
ANTENNA INPUTS: 300 ohms balanced; 75 ohms unbalanced (coxial)
INTERMEDIATE FREQUENCY (IF): 10.7 MHz
SENSITIVITY: 2 μV for 35 dB of quieting; 2.5 μV at 100% modulation ($\pm$ 75 kHz deviation) for 3% total noise and harmonic distortion
SIGNAL TO NOISE RATIO: 75 dB below 100% modulation
HARMONIC DISTORTION: 0.2% 20 Hz to 15,000 Hz, mono or stereo at 100% modulation. Typically, 0.05% at 1000 Hz
DRIFT: 25,000 Hz for the first two minutes; thereafter 5,000 Hz at 25° C in 24 hours
FREQUENCY RESPONSE: MONO — ($\pm$ 1 dB 20 Hz to 20,000 Hz with standard de-emphasis, (75 μS); STEREO — $\pm$1 dB 20 Hz to 15,000 Hz with standard de-emphasis (75 μS)

CAPTURE RATIO: 0.25 dB detector only; 2.5 dB complete tuner
SELECTIVITY: (IHF)

SET SWITCH TO:	NORMAL	NARROW	SUPER NARROW
Adjacent Channel	7 dB	22 dB	55 dB
Alternate Channel	55 dB	90 dB	90 dB

SPURIOUS REJECTION: 100 dB IHF
IMAGE REJECTION: 100 dB, 88 to 108 MHz. (IHF)
INTERMODULATION DISTORTION: 0.2% mono or stereo for any combination of frequencies from 20 Hz to 15,000 Hz with peak modulation equal to 100% or less. Typically 0.1%
MAXIMUM SIGNAL INPUT: 12 volts across 300 ohm antenna terminals will not increase harmonic or intermodulation distortion
AUDIO HUM: 70 dB down from 100% modulation
MUTING: 70 dB noise reduction between stations
MUTING THRESHOLD (Typical): Distant position 5 μV; Local position 20 μV
SCA FILTER: 50 dB down from 67 kHz to 74 kHz; 275 dB per octave slope
STEREO SEPARATION: 40 dB at 1,000 Hz



MR 78 Block Diagram

STEREO FILTER (Typical): 10 dB noise reduction in Position 1; 20 dB noise reduction in Position 2
AUDIO OUTPUT: Front panel controlled: 2.5 volts into 47,000 ohms; Fixed output: 2.5 volts into 47,000 ohms; 1.0 volt into 600 ohms
(All tuner performance limits were measured with SELECTIVITY switch set at NORMAL, unless otherwise stated)

GENERAL INFORMATION

POWER REQUIREMENT: 120 volts, 50/60 Hz 35 watts
SEMICONDUCTOR COMPLEMENT: 3 JFET's, 2 MOSFET's, 17 Bipolar Transistors, 43 Diodes, 4 Integrated Circuits

MECHANICAL INFORMATION

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 1-1 /2 inches (3.81 cm) in front of mounting panel
WEIGHT: 27 pounds (12.25 kg) net, 39 pounds (17.69 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

Franchised Dealer:

AUDIO ASSOCIATES
4802 C mp Bowie 732-44-5
Fort Worth, Texas 76107

McIntosh Laboratory, Inc.
2 Chambers St., Binghamton, N.Y. 13903
Phone area 607 723-3512

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