

McIntosh

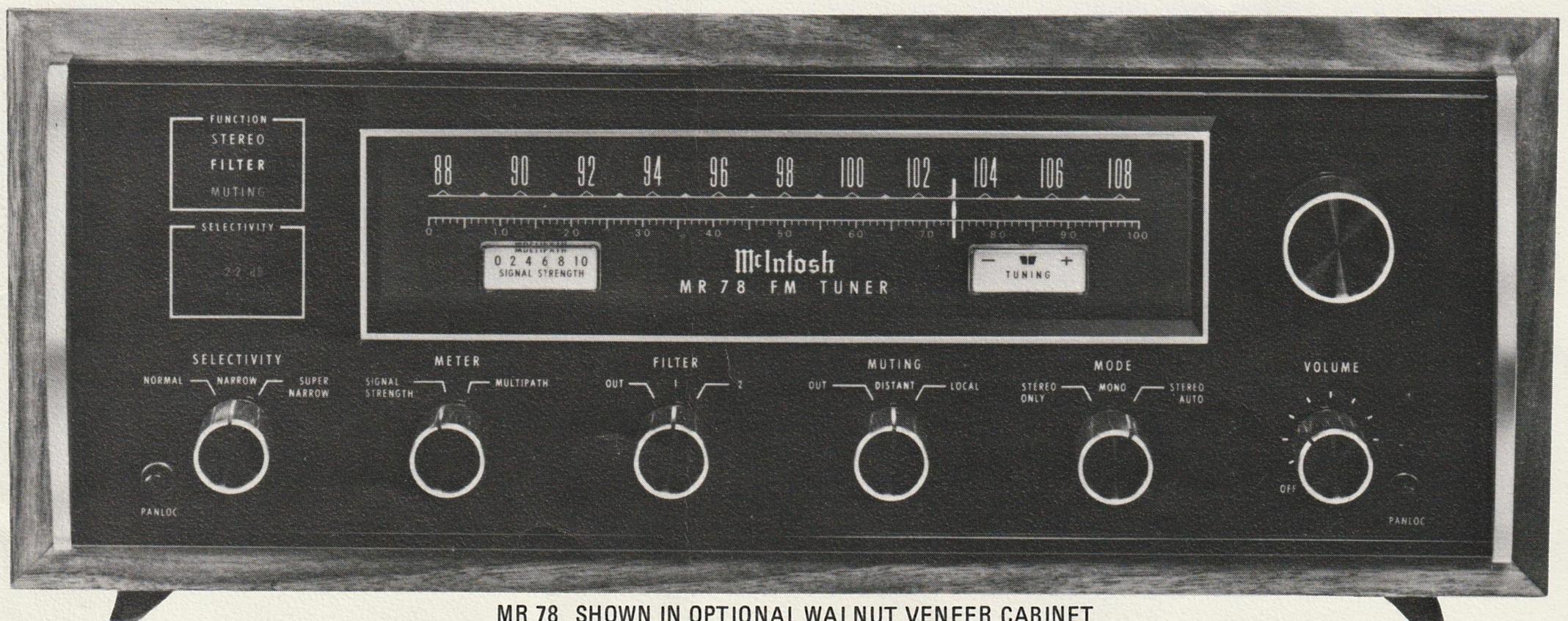
The McIntosh MR 78 FM/FM stereo tuner breaks McIntosh performance records. McIntosh tuners have exceeded the performance capabilities of all other tuners available today. Yet with the MR 78, an outstanding improvement has been achieved. It has the lowest distortion and greatest selectivity characteristics ever combined in a tuner. It 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 can be mentioned:

- Multiple 'selectivity', normal, narrow and super narrow, switchable from the front panel. An elegant solution to a tough problem. Switching is done by means of diodes using "DC" switching; 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.
- Linear Phase (constant delay) IF amplifier for low distortion at even high selectivity and low distortion. (Patented). Two eight-pole filters are selectable as well as a four pole multi element crystal in the super narrow position.
- A 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 providing a "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.

THE ULTIMATE FM TUNER

- Highest spurious rejection 100 dB (IHF) and highest image rejection 100 dB (88 to 108 MHz). This means you receive the stations at only the right place on the dial. You don't receive the same stations or some mixture as you tune across the dial.
- Ultra Sonic 'muting' provides smooth inter channel FM noise suppression.
- 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 maximum separation.
- Uses a balanced mixer and coupling transformer circuit for low intermodulation effects.
- See the performance limits on the back page for many other outstanding characteristics of this remarkable unit.



MR 78 SHOWN IN OPTIONAL WALNUT VENEER CABINET

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

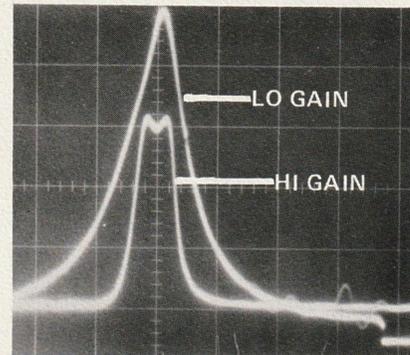
THE REMARKABLE MR 78 TUNER

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 ANTENNA 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.



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-modulate. 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. Every MR 78 tuner must pass the 12 volt overload test.

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.

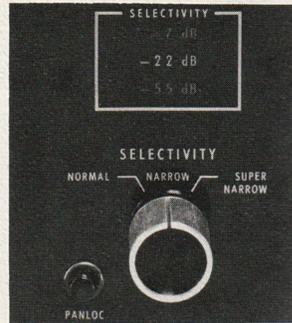
Another new design in the MR 78 front end is the integrated circuit balanced mixer. This mixer is practically impossible to overload. Oscillator pulling, cross modulation, and other types of distortion so common in ordinary transistor or FET mixers is minimized. A balanced bifilar transformer couples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

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 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 linear phase 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 selec-



tive 16-pole composite IF filter. In the NARROW position interference is reduced while receiving distant stations.

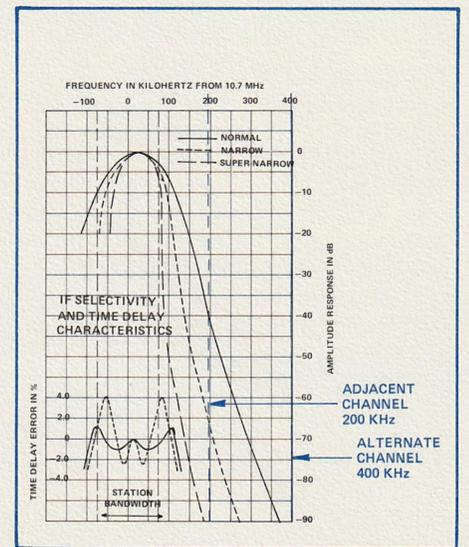
SUPER NARROW position adds a 4-pole 4-zero crystal filter (total 20 pole) to the two other IF filters. SUPER NARROW permits receiving distant stations which are on channels adjacent to local stations. With an adequate FM antenna there are usable signals never heard before with any other FM tuners.

LINEAR PHASE FILTER IF AMPLIFIER

The MR 78 uses a linear-phase IF filter that was designed from a FORTRAN computer program. It 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. 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 linear-phase 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 filters at NORMAL and NARROW positions of the SELECTIVITY switch settings.



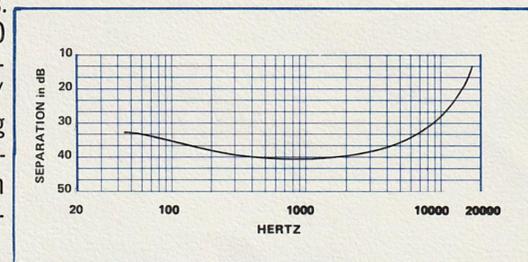
LINEAR PHASE BRIDGE DISCRIMINATOR

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.

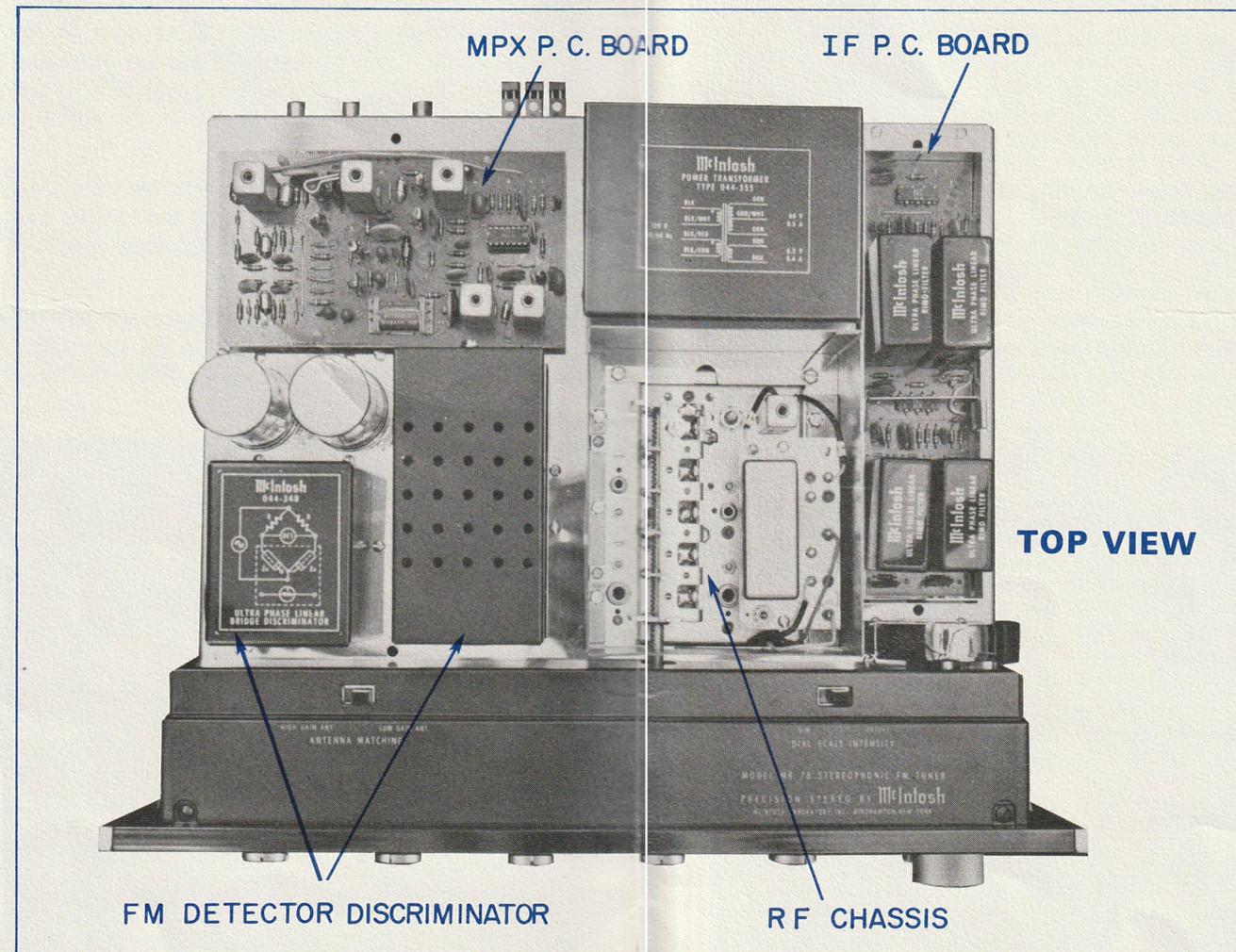
STEREO DECODER

An integrated circuit audio amplifier with over 120 dB of negative feedback in two loops is used to minimize 19,000 Hz inter-modulation beats. MUTING, STEREO ONLY, and AUTOMATIC STEREO/MONO switching are functions performed within the stereo decoder.



STEREO FILTER

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.



MR 78 — Performance Limits

Ceretti

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 (coaxial)

INTERMEDIATE FREQUENCY (IF): 10.7 MHz

SENSITIVITY: $2\mu\text{V}$ for 35 dB of quieting; $2.5\mu\text{V}$ at 100% modulation (± 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 ± 1 dB 20 Hz to 20,000 Hz with standard de-emphasis, (75 μS); STEREO ± 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 $5\mu\text{V}$; Local position $20\mu\text{V}$

SCA FILTER: 50 dB down from 67 kHz to 74 kHz; 275 dB per octave slope

STEREO SEPARATION: 40 dB at 1,000 Hz

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

- McIntosh instruments are designed and manufactured for long life.
- McIntosh instruments have always been designed for long life with low maintenance costs and high quality performance. McIntosh instruments have been and are the LABORATORY STANDARD for the world. Until 1949 the performance requirements for a McIntosh has long been an engineering dream. They became a reality with the introduction of the first McIntosh amplifier. Through all these years McIntosh has produced instruments that have exceptionally long life. Regardless of age, most McIntosh instruments are still in use today. Amplifier clinics held all over North America have shown that most of the McIntosh instruments ever manufactured are still in service today and still meet or exceed original exacting requirements for performance that were required of them when new.
- Used McIntosh instruments enjoy the highest resale value in this field. Retailers report that customers are constantly searching for used McIntosh instruments. A McIntosh does not remain on the "Used" display long. You'll get more when you trade-in your McIntosh assuring you of maximum return on your investment.

- McIntosh dedication, not only to improvements, but also to fundamentals, has justified many patents on refinements as well as basic circuit structures.
- The size of the McIntosh investment in professional testing instruments bears eloquent testimony to the commitment to acquire knowledge for the benefit of our customers. 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, etc. Only through this impressive investment, through continuous testing and research, through product analysis, and endless measurement can McIntosh promise and deliver to you reliability, long life, performance, highest value, and freedom from service.
- Since its beginning in 1949, McIntosh Laboratory has had the same ownership and management. McIntosh is the only company in this industry that has had this kind of history. McIntosh has been and is still dedicated to the best possible values.
- Doesn't it make good sense to deal with a company that wants to do as much for you as it possibly can?

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