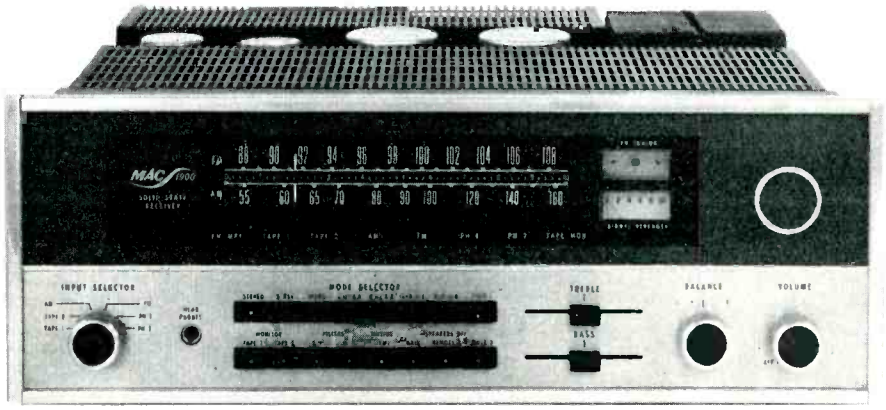
McIntosh MAC-1900 AM-FM/Stereo FM Receiver



MANUFACTURER'S PUBLISHED SPECIFICATIONS

FM Tuner Section

IHF Usable Sensitivity: 2.5 μV (13.4 dBf), mono. **S/N Ratio:** 70 dB, Mono. **THD:** Mono, 0.3%; stereo, 0.7%. **Capture Ratio:** 1.8 dB. **Selectivity:** 55 dB. **Spurious Rejection:** 90 dB. **Image Rejection:** 80 dB. **Stereo Separation:** 34 dB (at 1 kHz). **Frequency Response:** 20 Hz to 15 kHz ±1 dB.

AM Tuner Section

Sensitivity: 75 μV, external antenna. **S/N Ratio:** 45 dB. **THD:** 1.0%. **Selectivity:** 30 dB. **Image Rejection:** 65 dB. **Frequency Response:** −6 dB at 3500 Hz.

Preamplifier/Control Section

Input Sensitivity: Phono 1 & 2, 2.0 mV; Tape 1 & 2, 250 mV. **Hum and Noise:** Phono 1 & 2, 76 dB below 10 mV referenced input; Tape 1 & 2, 90 dB below rated output. **Bass Control Range:** ±16 dB at 20 Hz. **Treble Control Range:** ±16 dB at 20 kHz. **Low Filter:** −18 dB at 20 Hz, 12 dB/octave slope. **High Filter:** −18 dB at 20 kHz, 12 dB/octave slope.

Power Amplifier Section

Power Output: 55 watts per channel, continuous power, into 8 ohms, at any frequency from 20 Hz to 20 kHz with no more than 0.2% total harmonic distortion; 40 watts into 4 ohms and 30 watts into 16 ohms, all other conditions remaining the same. All ratings with both channels driven. **IM Distortion:** 0.2% for any combination of frequencies between 20 Hz and 20 kHz. **Hum and Noise:** 95 dB below rated output. **Damping Factor:** 56 at 8 ohms.

General Specifications

Dimensions: 16 in. W x 5 ½ in. H x 15 in. D. **Weight:** 33 lbs. **Suggested Price:** $949.50.

It was 1965 when *Audio* Magazine last published a test report dealing with a piece of McIntosh high fidelity equipment. Certainly, this omission was not promted by any desire on our part to ignore the products of that highly reputed manufacturer whose products have been well received by loyal purchasers since 1949. The fact that McIntosh Laboratories, Inc., has been able to survive and prosper in an era of fierce competition and intense advertising and promotion is in itself ample testimony to the power of word-of-mouth advertising. McIntosh owners, fiercely loyal to the product and the company, have on many occasions accused this and other publications of deliberately ignoring that firm's products because of their policy of limited advertising in this and other hi-fi publications.

What few readers realize is that the conspicuous absence of McIntosh test reports in these pages over the last several years was primarily due to McIntosh's own reluctance to permit "less than qualified" test reviewers to "measure" the equipment on "less than professional" laboratory equipment. We are happy to report that, after representatives of the company had an opportunity to examine our test facilities, they have reversed their earlier decision and, from time to time, we hope to make up for their overly long absence from these pages.

The MAC-1900 tested for this report is not a new product. It has been in production for some six or seven years, and we were therefore particularly anxious to see how it would "stand up" against more recently designed receivers.

The ruggedly designed black and gold front panel extends beyond the chassis width and height, making custom installation simple; the MAC-1900 is normally supplied less wooden enclosure. FM, AM and logging scales, plus twin tuning meters in the dial area, are augmented by a series of illuminated rectangular areas below, which denote program source selected, tape monitor circuit activation, and stereo FM reception. A large tuning knob to the right of the dial area is coupled to a smooth and effective flywheel, dial string, and pointer combination. The pointer center is brightly illuminated.

The lower section of the front panel includes a six-position input selector switch and rotary balance and volume controls. The counterclockwise position of the volume control turns off power to the entire receiver. Horizontally oriented linear slide controls take care of bass and treble adjustment, and a slight detent in each slide helps locate midposition for flat response. Two banks of pushbuttons handle all other control features. The upper bank of eight buttons handles a variety of reproduction modes including: stereo, reverse, channel source to both speakers, combined channels to any single speaker, and mono. A loudness switch completes this row of buttons. The lower bank of pushbuttons selects high and low filters, either or both tape monitor

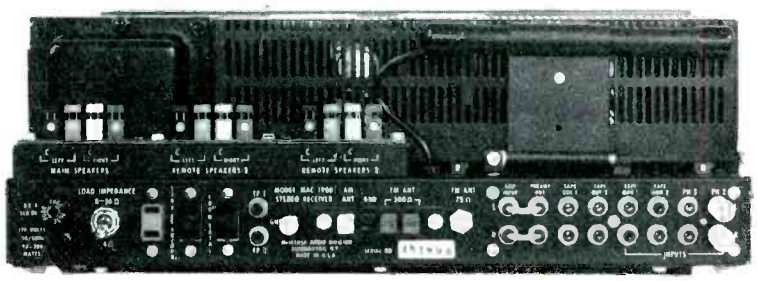


Fig. 1—Back panel.

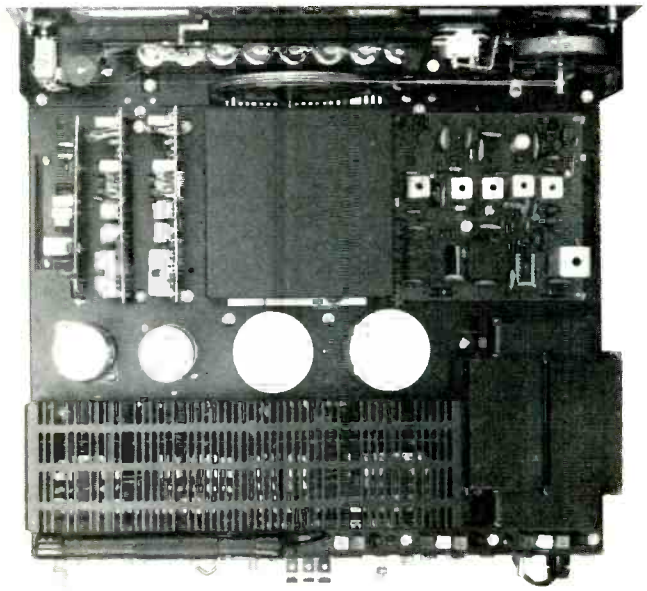


Fig. 2—Interior view from top.

Fig. 3—Interior view from bottom.

circuits, FM muting, and up to three separate pairs of loudspeakers which might be connected to the receiver. With speaker buttons in the *Out* position, sound is heard from the appropriate set of speakers, so that to turn any or all sets of speakers *Off* it is necessary to depress one or more buttons in this group.

The rear panel of the MAC-1900 is pictured in Fig. 1. All speaker connection terminals are mounted upright, which makes connection very easy since stripped speaker-wire ends are simply inserted in the spring-loaded, push-button terminals horizontally, as the speaker cables would normally be dressed. Care must be taken, however, not to strip and insert too great a length of wire which might project through to the opposite side of the terminal and make contact with metallic structures on the topside of the chassis.

The rear panel of the chassis contains three convenience a.c. outlets, two pairs of phono inputs, two sets of *Tape Out* and *Tape Monitor* (high level) inputs, antenna terminals for connection of external AM, 300-ohm FM or 75-ohm FM antenna transmission lines, a chassis ground terminal, and a pair of jumpers which connect between *Preamp Out* and *Main Amp In* jacks. Jumpers can be removed for independent use of these two sections of the receiver. A pair of jacks labelled *TP-1* and *TP-2* are intended for connection of McIntosh's Maximum Performance Indicator, a special scope/meter product sold by McIntosh that is useful in testing and evaluating audio system performance. A power line fuse and a pivotable AM ferrite bar antenna complete the rear panel layout.

The MAC-1900 is supplied less wooden enclosure but all components are fully shielded and enclosed in black finished metal covers, two of which were removed for the photo of Fig. 2 which is a top view of the chassis layout. The fully shielded r.f. front-end can be seen centered in the chassis with the i.f. section to the right and three of the many circuit boards vertically mounted at the left. A view of the underside of the chassis is shown in Fig. 3 and the orderly harnessed wiring is clearly discernible, as are additional circuit modules.

Circuit Highlights

Two stages of r.f. amplification (one a dual-gate MOS-FET, the other a JFET) are used in the FM r.f. section, and tuning is accomplished by means of a four-section variable capacitor (three additional ganged sections handle AM tuning). The mixer also uses a JFET, while the local oscillator is a bi-polar device. A monolithic silicon differential/cascode amplifier, in the form of an IC, serves as the first i.f. amplifier stage and is located within the r.f. housing. The FM i.f. section uses two additional IC's and two quad-tuned, link-coupled filters for a total i.f. gain of over 120 dB. Filters are sealed and require no realignment. A true Foster-Seeley discriminator is used as an FM detector. (Seeing it was like meeting an old reliable friend after an absence of several years.) The stereo decoder section of the receiver is fairly conventional in design and employs a bridge-type switching demodulator. Special attention is paid to SCA filtering.

The AM section, in addition to employing a separate r.f. amplifier and two i.f. stages, incorporates a 10-kHz adjacent-channel filter (another nicety that has been *"overlooked"* in so many receivers where AM is designed in pretty much as an afterthought).

The phono-equalizer sections use three transistors per channel for the 42-dB mid-band gain required, so that feedback is applied even at 20 Hz where maximum bass boost is required by RIAA playback curves. A differential amplifier is used at the high-level input stages, and tone controls are of

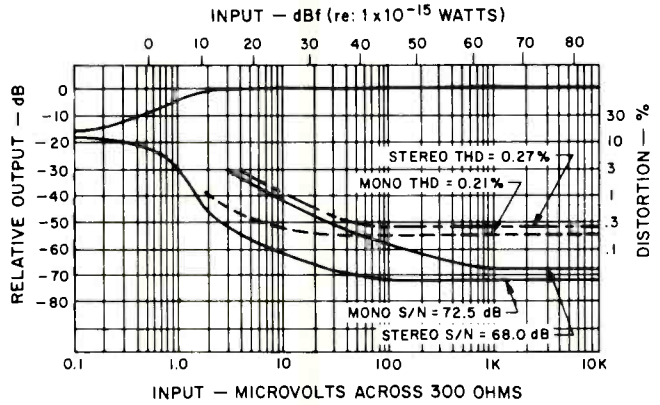


Fig. 4—FM quieting and distortion characteristics, 1-kHz signal, 100% modulation.

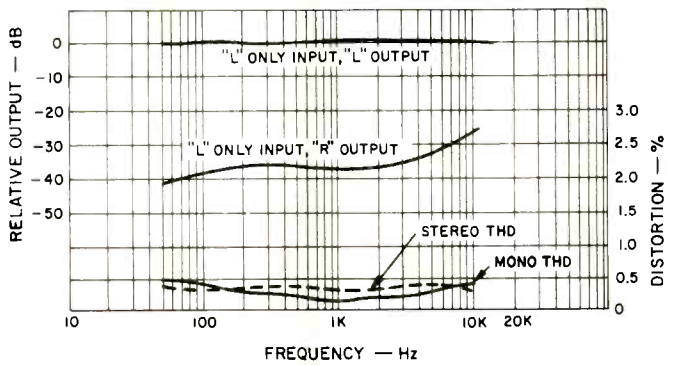


Fig. 5—Separation and distortion versus frequency.

the familiar negative feedback type. Tone controls and associated components are mounted on a double-sided plated-through printed circuit board.

The power amplifier sections also use a differential input stage, one input of which is the negative feedback voltage from the power output stages. The output section is a direct-coupled, series push-pull amplifier. Circuit protection is afforded based first upon temperature of output transistor cases (a sensing device turns off a.c. in the event of thermal problems) and by McIntosh's Sentry Monitoring Circuit, which restricts drive to the output stages if power dissipation exceeds safe limits because of excessive mismatching or shorting of the outputs. Output signals are direct coupled, thanks to the dual polarity 40-volt supplies. An additional supply powers the driver stages, while two more regulated voltage supplies handle tuner and preamp stages.

FM Performance Measurements

Although McIntosh has modified its specification sheet to fully conform with the new FTC rule on power output disclosures, their statements regarding FM performance have not been up-dated to reflect requirements of the new IHF/IEEE tuner measurements standards. For example, signal strength figures are only quoted in microvolts (instead of dBf), and many of the new required stereo performance figures are absent. As we soon learned, these omissions are not the result of inadequate performance in these areas. Usable mono sensitivity, guaranteed to be better than 2.5 μV (13.4 dBf)—all McIntosh specs are stated as "limits" which every set is guaranteed to make or better—actually measured 2.0 μV (11.4 dBf). Stereo usable sensitivity (not quoted by the manufacturer) turned out to be an excellent 3.0 μV (14.9

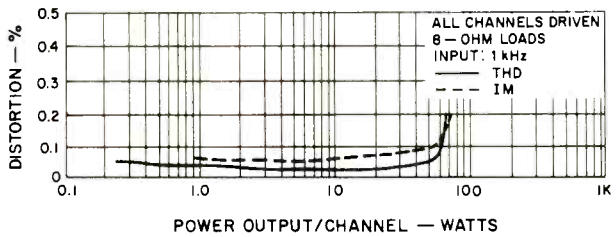


Fig. 6—Harmonic and intermodulation distortion characteristics with 8-ohm loads.

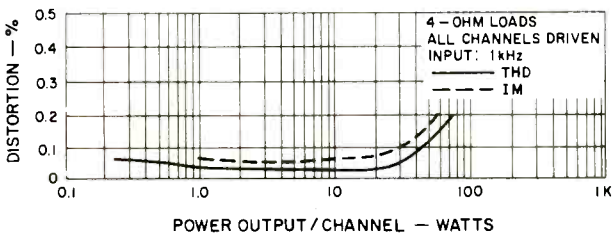


Fig. 7—Harmonic and intermodulation distortion characteristics with 4-ohm loads.

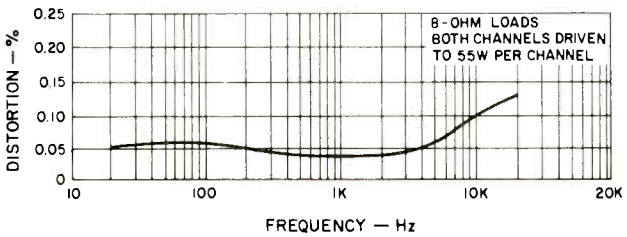


Fig. 8—Harmonic distortion versus frequency.

dBf). The 50-dB quieting level in mono was reached with an input signal strength of 3.0 μV (14.9 dBf), while in stereo the signal strength required for this degree of quieting was an impressively low 25 μV (33.4 dBf). Best signal-to-noise ratio in mono reached 72.5 dB, passing the 70-dB mark at just under 50 μV (39.4 dBf), while in stereo best S/N was 68 dB. Quieting and distortion characteristics for a 1-kHz signal in mono and stereo at 100% modulation are graphed in Fig. 4. THD in mono reached a low of 0.21%, while in stereo THD was almost as low, with a reading of 0.27%.

Stereo separation, while not as great as in some more modern receivers which use phase-lock-loop MPX circuitry, exceeded mid-band specs and measured 37 dB at 1 kHz. Separation and mono and stereo distortion at other frequencies are plotted in the graphs of Fig. 5.

The single failing that we noted in the stereo section of the Mac 1900 was its poor rejection of sub-carrier products at the tape output (and even at the speaker output) terminals. Such high frequency output components were down about 35 dB at the tape output terminals and might cause problems when recording FM stereo programs "off the air" on tape decks not equipped with separate MPX filters, especially when Dolby encoding is used. On the other hand, 75-microsecond de-emphasis was just about perfect all the way out to 15,000 Hz—a situation very seldom encountered on tuners and receivers which sharply filter out 19-kHz and 38-kHz residual products.

Other performance measurements all turned out to be better than published specs as well, with capture ratio reading 1.5 dB, alternate channel selectivity readings of 62 dB, image rejection of 83 dB, and spurious response rejection in excess of 100 dB—the limit of our measuring capability.

Amplifier/Preamplifier Measurements

Figure 6 is a plot of distortion versus power output per channel with power delivered to 8-ohm loads. McIntosh's conservative ratings are even more apparent in the amplifier and preamplifier sections of this receiver than in the tuner section. Some 66 watts per channel was delivered by the amplifier before rated THD of 0.2% was reached. At Mac's rated output of 55 watts per channel, THD was still a mere 0.035%, while IM distortion measured just under 0.1% for that level of power output, reaching its rated value of 0.2% for 70 watts per channel of output power.

McIntosh is one of the few manufacturers which has continued to offer a 4-ohm power output rating in this era of FTC amplifier power regulations. In an addendum sheet supplied with the owner's manual, power output into 4-ohm loads is listed at 40 watts per channel. While this may seem contradictory to the laws of physics (nearly all solid-state amplifiers deliver greater power into 4-ohm loads than into 8 ohms), one must remember that the FTC power rule (specifically, the preconditioning requirement) places severe thermal limitations on amplifiers which might actually be expected to deliver much more power under musical or short-term high-power listening conditions. That, in fact, is just what happens if one measures the Mac 1900 at 4 ohms without regard to the one hour preconditioning requirement. It then delivers 72 watts per channel at mid-frequencies and not much less at the frequency extremes before reaching the 0.2% THD point. Power versus THD and IM for 4-ohm load conditions is plotted in Fig. 7. Figure 8 is a graph of THD versus frequency for a constant 55-watt output level per channel into 8-ohm loads. At the 20 Hz extreme, THD is still a very low 0.054%, while at 20 kHz THD

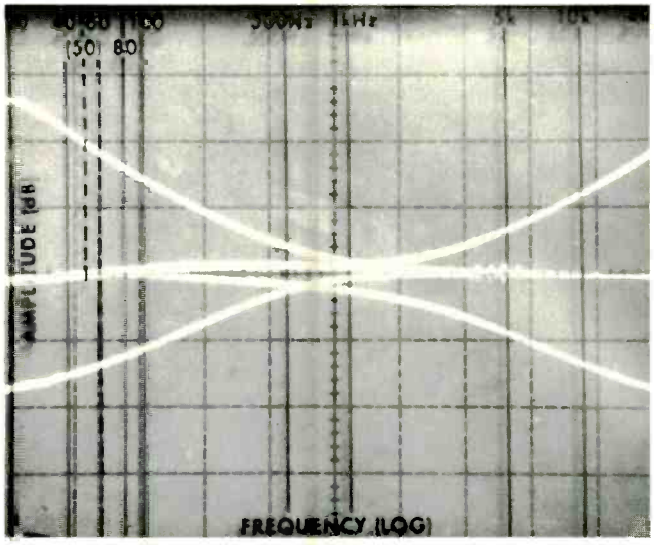


Fig. 9—Action of tone controls at full adjustment.

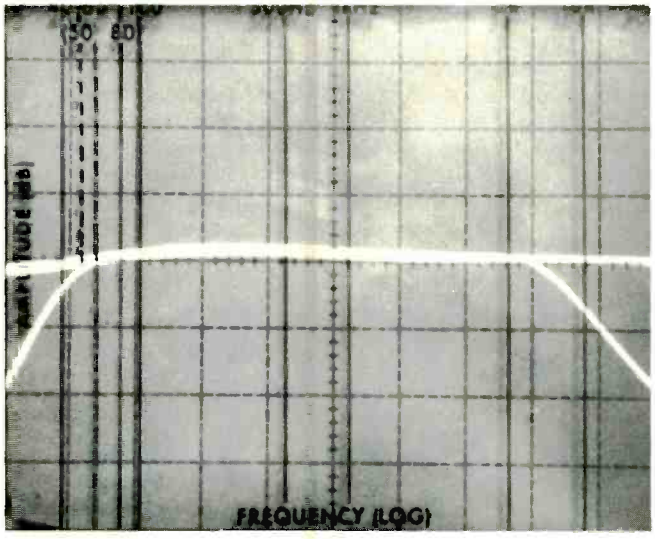
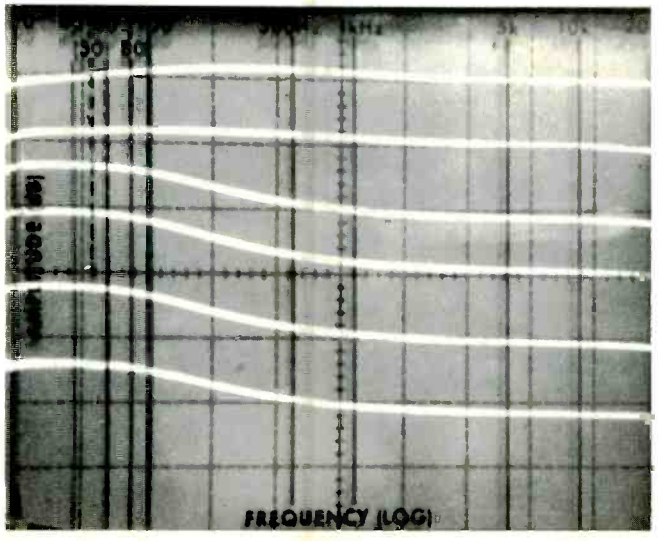


Fig. 10—Action of low- and high-cut filters.

Fig. 11—Action of loudness control.



reaches 0.13%—still well below the 0.2% nominal THD rating. At the 55-watt output rating, McIntosh could well have specified the power band as extending all the way from 16 Hz to 28 kHz had they been willing to "push" the published specs as far as some other manufacturers.

As for the preamplifier and control sections of the Mac 1900, we measured an input sensitivity for both sets of phono inputs of exactly 2.0 mV, as claimed. Phono overload at 1 kHz occurred at an input level of 110 mV (not the highest we have ever recorded, but certainly high enough for all practical purposes). Hum and noise in phono, referred to actual 2.0 mV input sensitivity was an amazingly high 72 dB. Translated to a 10 mV input reference, the figure becomes an incredible 86 dB! RIAA equalization was accurate to within 0.5 dB from just under 100 Hz to 15,000 Hz but was off by about 2 dB at the 30 Hz frequency extreme.

Bass and Treble control range is depicted in the sweep-frequency plots of Fig. 9, while the precise characteristics of the low- and high-cut filters are similarly plotted in the 'scope photo of Fig. 10. Loudness control action, in 10-dB increments beginning from full clockwise rotation of the volume control, is depicted in the sequential traces of the storage 'scope photo in Fig. 11. Hum and noise measured via the high-level (tape) inputs of the MAC 1900 measured 92 dB, while residual power amplifier noise and hum was 96 dB referred to full power output.

Listening and Use Tests

One can argue about the importance of "super-low" distortion, ultra wide-band frequency response (the MAC-1900 rolls off 3 dB at 8 Hz and 45 kHz), ultra high damping factors (the MAC 1900 has a damping factor of 56 at 8 ohms), and the need for super-high phono overload capability all day long, but the proof, after all, is in the listening. And the MAC-1900 "listens" extremely well. Bass is tight and well defined and, rated power notwithstanding, we were able to drive several low-efficiency speaker systems (which are reputed to require higher input power than the MAC-1900 provides) to bigger-than-life sound pressure levels with no audible evidence of amplifier clipping or other forms of audio misbehavior. In terms of absolutes, the FM tuner section does not measure as well in many respects as do some of today's brand new tuners and receivers, but then again we come back to the question of program sources available from FM stations, the majority of which are far poorer than the inherent performance capability of the tuner section of this relatively "old" McIntosh design. We should note, by the way, that the AM tuner section of this receiver is extremely well designed for its time or even in terms of what is generally provided as an AM section on most of today's competitive AM/FM receivers.

All of which brings us to the suggested retail price of the MAC-1900, which seems, at first glance to be out of line if measured on a watts/dollar basis. Talk to any Mac equipment owner, however, and you will rarely hear a complaint about the high initial cost of McIntosh equipment. The Mac loyalists inevitably end up talking about long-term reliability, quality of parts used in construction (we heartily concur here), absence of service problems and "down time," and total willingness of the company and its selected dealers to render prompt and complete service if the need ever does arise. These components of the "McIntosh Mystique" are hard to translate into dollars and cents, to be sure, but sufficient numbers of Mac enthusiasts have been able to justify initial costs of McIntosh equipment to make that company one of the longest lived and highly respected in the United States and abroad. *Leonard Feldman*