LARRY GREENHILL

McIntosh MAC7200

STEREO RECEIVER

Recently, I received an email from Editor Jim Austin. "Larry, do you still use your Day Sequerra FM Reference tuner to listen to FM radio?" he asked.[1]

"Jim, yes, I still listen to FM classical music in the Bay area. Why?"

"I had kind of a crazy idea. McIntosh has lots of good *new* stuff coming out now, but I want you to review the MAC7200 *receiver*, which isn't new. I like FM radio. I'd listen to FM a lot more, except that I'm stuck on the first floor in a neighborhood full of very tall brick and stone buildings. I am literally a 3-minute walk from Columbia, but I cannot receive Columbia's powerful radio station—WKCR—in decent quality due to multipath. So, unless we move up in the world, literally, I won't be listening to terrestrial radio much anytime soon."

I was intrigued. This would be my first review of an FM tuner in decades and *Stereophile*'s first review of a stereo receiver since Herb Reichert reviewed the Outlaw Audio RR2160[2] "retro receiver" and loved its sonics and low price. Still in production, the RR2160 is the only stereo receiver still listed on the spring 2020 Recommended Components list. Is it time to add another?

Keith Jarrett's "Part 7" from his 2006 *Carnegie Hall Concert* had both a warm piano timbre and tight, syncopated, rhythmic drive that had me tapping my foot and singing along.

Design

During its 71-year history, McIntosh has produced some

1 Day Sequerra Reference Monitor FM tuner, Vol.21, No.6; 25th Anniversary Edition, Vol.36, No.11. My original review of the FM Reference Monitor appeared in the December 1991 issue of *Stereophile* (Vol.14, No.12). Although *Stereophile*'s website doesn't include my original review, it can be seen in full at allegrosound.com/DaySequerra-FMR.html.

2 See stereophile.com/content/outlaw-audio-rr2160-stereo-receiver.

classic stereo receivers, including the MAC1500, MAC4100, and MAC6700. The MAC7200 is the company's newest, bundling into one huge chassis a 200Wpc stereo amplifier, a preamplifier with 14 inputs, a sophisticated FM/AM tuner, a 32-bit/192kHz DAC, and line-level and MM/MC phono preamplification. Inputs to its DA1 digital audio module[3] include two coaxial (S/PDIF), two TosLink, one USB, and one proprietary MCT DIN input that allows DSD to stream from a McIntosh SACD/CD Transport.

The MAC7200 shares many design features with the McIntosh 450Wpc MC462 stereo amplifier reviewed by Sasha Matson,[4] including single-winding output-stage Autoformers to optimize impedance match between the MAC7200's "ThermalTrak" output power transistors and the attached loudspeakers. McIntosh's Ron Cornelius explained to me that solid state amplifiers operate best—with the best sonics, lowest noise, lowest distortion, and least heat—into an optimal impedance, "say 2.7 ohms." The Autoformer matches the amplifier's "best load" impedance, while the 2, 4, or 8 ohm output taps match the loudspeaker, allowing the amplifier to deliver the same 200Wpc to different loudspeaker impedances.

The MC462 and MAC7200 employ rugged heatsinks, which are shaped to form the letters "MC" when viewed from above. Their output Autoformers and the power supply transformer are potted in black housings and sit exposed just behind the front panel, adorned by their circuit diagrams in old-school McIntosh fashion. Both have black chassis, blue watt meters, a black glass

3 The DA1 Digital Audio Module can be dealer-upgraded to the DA2 version to extend DSD native playback from DSD256 to DSD512 and DXD up to 394kHz. The DA2 includes an HDMI connector (not found on the current MAC7200's DA1 rear panel), which supports Audio Return Channel (ARC) functionality. This enables the MAC7200 to play the TV's audio through the stereo system and for the TV's remote to control the MAC7200.

4 See stereophile.com/content/mcintosh-laboratory-mc462-power-amplifier.

SPECIFICATIONS

Description Two-channel solid state receiver with line, phono, FM and AM tuners, tone controls, headphone output, class-AB output stage, D/A module. Analog inputs: 1 balanced (XLR); 5 single-ended (RCA); 1 single-ended (RCA) power amplifier; MM phono; MC phono; 1 pass-through; 75-ohm external FM Antenna; RJ45 for RAA2 AM remote antenna. Outputs: 1 pair single-ended preamplifier (RCA), 1 pair single-ended Rec, 4 pairs five-way speaker binding posts (ground, 2, 4, 8 ohms). Phono sensitivity (for rated output): line level, 250mV; MM, 2.5mV; MC, 0.25mV. Input impedance: line-level, 20k ohms; MM, 47k ohms and 50pF; MC, 50, 100, 200, 400, or 1,000 ohms and 100pF. Maximum input: to MM, 80mV; to MC, 8mV. Voltage gain: Line level to outputs 1 and 2, 15dB; MM to Rec output, 40dB; MC to Rec output, 60dB; MM to outputs 1 and 2, 55dB; MC to outputs 1 and 2, 75dB; Power amplifier, 29dB. Input overload: 8V RCA, 16V XLR. Preamplifier output level for outputs 1 and 2: 1.4V. Digital inputs: 2 S/PDIF TosLink, 2 S/PDIF coaxial, 1 MCT, 1 USB (Type B). Sampling rate: S/PDIF, 44.1kHz–192kHz, 24-bit PCM; MCT, 44.1kHz–384kHz, 32-bit PCM, DSD64, DSD128, DSD256. Power output: 200Wpc into 2, 4, or 8 ohms (23dBW). Wideband damping factor: >40. Sensitivity: 2V balanced for full power output. Frequency response: 20Hz–20kHz, +0, –0.5dB; <10Hz–100kHz, +0, –0.3dB. THD: <0.005%, 20Hz–20kHz, 240mW–200W into 8 ohms. Intermodulation distortion: 0.005% maximum up to instantaneous peak power of 400Wpc for any combination of frequencies, 20Hz–20kHz. Input impedance: 20k ohms single-ended and balanced. Amplifier output impedance: N/A. Signal/noise at amplifier input: >113dB. FM tuner section: sensitivity: 2.2µV (18.1dBf); 50dB quieting sensitivity: 1.5µV (14.8 dBf); SNR: stereo, 68dB; Frequency response: 20Hz–20kHz ±1dB. Stereo separation: 38dB; THD stereo: 0.8%; Channel selectivity: 60dB Adjacent channel, 66dB Alternate channel. AM tuner section: frequency response: 50Hz–3000Hz. SNR: 50dB. THD: 0.5%. Sensitivity: 350µV/m. Power consumption 0.25W standby, 528W maximum. **Dimensions** 17.50" (444.5mm) W × 7.63" (193.7mm) H × 22.00" (558.8mm) D. Weight: 75lb (34.1kg), 93lb (42.3kg) in shipping box, 142lb with shipping pallet. **Finish** black. **Serial number of unit reviewed** AFN 1586. "Manufactured in USA." **Price** $7500. Number of US dealers: More than 300. Warranty 3 years parts and labor, nontransferable. **Manufacturer** McIntosh Laboratories, Inc. 2 Chambers St. Binghamton, NY 13903. Tel: (607)723-3512. Web: mcintoshlabs.com.

front panel, rotary control knobs, a green-lit "Olde English" McIntosh logo, and aluminum end caps. The MAC7200, though, is 2" shorter and 43lb lighter, and lacks the amplifier's front-panel aluminum handles. That means that, despite its lower weight, the receiver is harder to manage. Its meters are smaller, measuring 1" tall by 4.5" wide. The MAC7200's FM circuitry and performance are said to match the company's flagship MR87 FM tuner, minus its balanced outputs, stereo-blend/de-emphasis switch, and variable scan sensitivity. This tuner design is intended to provide reception of strong signals without distortion and also noise-free reception of distant, weak stations. Up to 20 stations for each band—FM and AM—can be stored as presets. DSP FM tuning circuitry minimizes multipath tuning noise. The front panel's multipurpose display shows the noise level and multipath of the incoming RF signal, facilitating optimal positioning of the FM antenna for optimal reception.

The information display sits below and in between the watt meters and changes with each input selected, showing trim-control adjustments, FM and AM presets, and AM and FM tuner settings. To the left of this display is the rotary input selector knob and a Preset Control knob. To the right is the tuning knob and a large volume-control knob. The lowest row on the panel, moving left to right, includes the headphone connector for dynamic headphones, selector pushbuttons for two sets of stereo speakers, an IR sensor, a tone control/bypass toggle, a mute button, and Standby/On. All the front-panel control functions are duplicated on the MAC7200's slim, well-designed remote.

The MAC7200's rear panel[5] is divided into upper and lower portions. The upper portion contains the DA1 digital audio connections: 2 S/PDIF coaxial and 2 TosLink optical inputs, the MCT DIN connector, and a USB-B digital audio input. Next to the DA1 module is a 75 ohm antenna input, an RJ45 jack for the AM antenna, and various control ports.

Flanking these upper-portion connectors are the four gold-plated speaker terminals for each channel. I connected the spade lug from one of my R50 Pure Silver Speaker Cables to the bottom unmarked speaker terminal and the other to either the 2, 4, or 8 ohm terminal. I slid the spade lugs on the terminals and tightened the nut with my fingers and then with a small plastic wrench that came in the box.

The lower panel, moving left to right, offers a socket for a detachable AC cord, the main fuse holder, two preamplifier outputs (one has a jumper plug to the MAC7200's amplifier input), five pairs of unbalanced RCA connectors, a ground terminal, the two phono inputs (MM and MC), and a pair of unbalanced inputs. HDMI and AES/EBU digital input connectors are not included on the rear panel. Ron Cornelius explained that both AES/EBU and HDMI connectors and their associated circuitry occupy large portions of the rear panel and internal circuit boards, so McIntosh decided not to include them. He finds that AES/EBU digital are better suited to recording studios than home settings.

Readers patient enough to read through this description will appreciate the MAC7200's complexity. Fortunately, its 39-page printed owner's manual—with 132 diagrams and large, clearly written foldout illustrations—lists the name and function of every connector, control, display panel, and speaker terminal. For someone who struggles with PDF manuals, the MAC7200's printed and well-illustrated

instructions were a blessing. Thank you, McIntosh!

Setup

The 75lb MAC7200 measures 17.5" wide by 7.6" high by 22" deep. It shipped to me in a sturdy cardboard package weighing an additional 18lb, strapped to a wooden pallet with metal bands, bringing the total shipping weight to 142lb. After the trucker moved the pallet into my garage on a hydraulic dolly, I cut the metal bands with Wiss Aviation Snips, then "walked" the 93lb box into my condo. Cutting away the packing tape, I opened the outside carton to reveal a second internal box suspended on Styrofoam blocks. I walked this inner carton up the stairs to my listening room, as its weight and size made it impossible for me to lift it off the floor.

The MAC7200 is shipped with the owner's manual, a warranty card, a McIntosh HR085 remote, an RAA2 AM antenna, a detachable AC mains cord, a black plastic speaker terminal wrench, and a 20' coaxial cable with JR45 connectors for the AM antenna.

As the MAC7200 does not come with an FM antenna, I connected my Day Sequerra FM Urban Antenna[6] to its 75 ohm threaded antenna terminal. For AM reception, I connected the McIntosh RAA2 remote AM antenna, a brick-sized black plastic box, to the rear-panel RJ45 connector via

5 The layout and functions of the rear-panel connectors can be best understood using the large 8.5" by 22" quick-setup diagram folded into the manual. It contains a life-size drawing of the receiver with arrows for each connector with an explanation.

6 See *Stereophile*'s review of the Day Sequerra Urban FM antenna, Vol.12, No.7, published in July 1989.

MEASUREMENTS

I tested the McIntosh MAC7200 with my Audio Precision SYS2722 system (see the January 2008 "As We See It"[1]). I looked first at its behavior via its balanced and single-ended line inputs, mostly with the volume control set to its maximum, "100%," then at lower settings. I performed a complete set of tests from the receiver's 8 ohm output transformer tap, then repeated several tests from the 4 ohm and 2 ohm taps. I preconditioned the receiver by following the CEA's recommendation of operating it at one-eighth the specified power into 8 ohms for 30 minutes. At the end of that time, the heatsinks were very hot, at 151.8°F (66.6°C). After letting the MAC7200 cool down, I continued the testing.

For the balanced input, the maximum gain at the loudspeaker outputs into 8 ohms was 38.25dB from the 8 ohm tap, 34.7dB from the 4 ohm tap, and 32.2dB from the 2 ohm tap. The maximum gains from the unbalanced inputs were all 6dB higher. With the jumpers that connect the preamplifier outputs to the power amplifier inputs removed, the gains from the input labeled "PWR AMP" measured 20.2dB at the 8 ohm tap, 16.7dB at the 4 ohm tap, and 14.2dB at the 2 ohm tap. From the unbalanced line input at the preamplifier and headphone outputs, the maximum gain measured 15.4dB and 19.6dB, respectively. The MAC7200 preserved absolute polarity (ie, was noninverting) at all of its outputs.

The MAC7200's unbalanced line input impedance was 21.5k ohms at 20Hz and 1kHz, dropping to 19k ohms at 20kHz. The balanced input impedance was 33k ohms across the audioband. The power amplifier input impedance was 10k ohms from 20Hz to 20kHz. The preamplifier output impedance was a low 220 ohms at 1kHz and 20kHz, increasing to 403 ohms at 20Hz; the headphone output impedance was 48 ohms at all audio frequencies. The McIntosh's headphone output will work best with high-impedance headphones.

The amplifier's output impedance at the 8 ohm tap was 0.16–0.19 ohms depending on frequency. The 4 ohm tap's output impedance was 0.114 ohms, that of the 2 ohm tap 0.12 ohms, both from 20Hz to 20kHz. All these measurements include the series impedance of the loudspeaker cable. The modulation of the amplifier's frequency response, due to the Ohm's law interaction between this source impedance and the impedance of our

1 See stereophile.com/content/measurements-maps-precision.

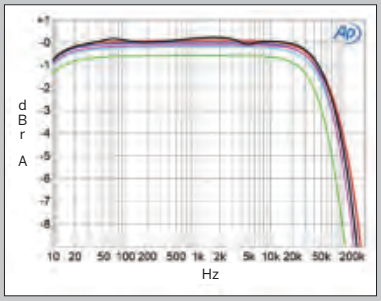

Fig.1 McIntosh MAC7200, 8 ohm tap, frequency response at 2.83V into: simulated loudspeaker load (gray), 8 ohms (left channel blue, right red), 4 ohms (left cyan, right magenta), 2 ohms (green) (1dB/vertical div.).

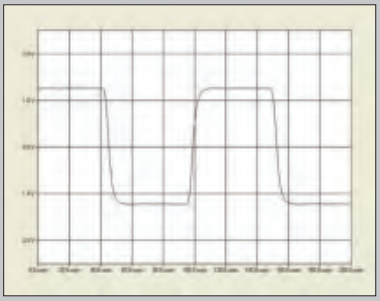

Fig.2 McIntosh MAC7200, 8 ohm tap, small-signal 10kHz squarewave into 8 ohms.

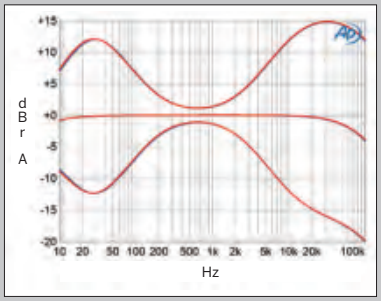

Fig.3 McIntosh MAC7200, 8 ohm tap, frequency response at 2.83V into 8 ohms with treble and bass controls set to their maximum and minimum and switched out of circuit (left channel blue, right red, 5dB/vertical div.).

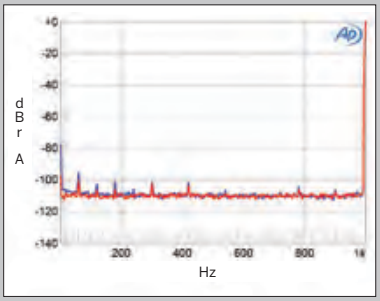

Fig.4 McIntosh MAC7200, 8 ohm tap, spectrum of 1kHz sinewave, DC–1kHz, at 1W into 8 ohms with volume control set to "100%" (left channel blue, right red, linear frequency scale).

a 20' cable included in the box.

Setup involved selecting the optimal amplifier-output speaker terminals—2, 4, or 8 ohms—for my Quad ESL-989 electrostatic speakers. Ron suggested I use the speaker manufacturer's nominal impedance rating or JA's measurement and then use a lower impedance speaker tap. Although Quad rates the ESL-989 as an 8 ohm speaker, JA measured it to be 6.5 ohm in the upper midrange, dropping to 3.3 ohms at 10kHz.[7] I selected the 4 ohm tap. My other speakers, Revel Ultima Salon2's,[8] were rated by the manufacturer at 3.7 ohms at 90Hz. JA measured its impedance to lie between 3 and 5 ohms, so I selected the 2 ohm tap.

Listening

I enjoyed controlling the MAC7200 with its HR085 remote. I switched among components and inputs with ease, comparing the digital and analog versions (converted by my Bryston BDA-3 DAC) from a Bryston BCD-1 CD player and from a Bryston BDP-3 media player. Listening to KDFC, a local classical music station, I compared the MAC7200's FM tuner with my Day Sequerra FM Reference 25th Anniversary tuner.

Throughout the listening sessions, the MAC7200 amplifier ran cool, its heatsink faintly warm while driving my Quad ESL-989 electrostatic speakers during long listening sessions. The MAC7200 never triggered the Quad's self-protection circuit. The Revel Ultima Salon2's also did brilliantly, playing with full dynamics and volume and with no sense that the amplifier was straining. The MAC7200 *did* briefly mute its outputs if the volume control was turned up too high. It never showed a fault condition that required its amplifier to be turned off and reset.

The FM tuner

Tuning with McIntosh's HR085 remote was precise: Each push on the remote's tuning ring changed the FM tuner's frequency by 0.2MHz. Tuning from the listening room chair was far more convenient than having to get up and turn the unit's tuning knob. Tuning is aided by the central display's bar graphs of signal strength, noise, and multipath. As the 7200 sat on the floor between me and the speakers, this display was easy to read.

Long ago, in the August 1997 issue of *Stereophile* (pp.21–23), Don Scott encouraged other reviewers to first listen to

FM tuners without an antenna to make sure the interstation static sounded "full spectrum, deep, and also crisp with a muted smoothness. … No squeals or birdies (oscillations) should be heard, as this indicates distortion being generated in either the front-end or IF amplification stages, which will give the tuner a nasty, gritty quality." The MAC7200's interstation static sounded ideal: smooth, nonirritating, and free of whistles, squeals, and peeps. Even though my Day Sequerra FM Reference provided better quieting when it had captured an FM signal, its rendition of interstation static without an antenna revealed a faint whistle.

The MAC7200's FM tuner proved to be very sensitive and selective. I live 19 miles north of San Francisco in the North Bay, and it pulled in 25 FM stations, 17 strong enough to fully "quiet" the tuner and produce a black background with minimal multipath or noise; that makes it one of the most sensitive and quietest FM tuners I've reviewed, equal to the Day Sequerra in sensitivity and selectivity. I created presets for KDFC (90.3MHz, for classical music), KCSM (91.1MHz, for Jazz), KQED (88.5MHz, for NPR), and KISQ (98.1MHz, for relaxing music). Listening to KDFC, I enjoyed a wide variety of classical music, including Antonio Vivaldi's *Violin Concerto in B-Flat, RV 375*. I continued to listen, leaving the FM radio on for several days. The convenience of the remote and the quiet, mostly noise-free source of classical music was wonderful.

How did the MAC7200 compare sonically to my Day Sequerra FM Reference 25th Anniversary tuner? I chose FM Reference because its transparency, imaging, warmth, and midrange timbre are the finest I've heard in a tuner.[9] The MAC7200 equaled the FM Reference's ability to generate a jet-black background and render the music punchy, dynamic, and involving. The FM Reference's sonics were more transparent and 3D when playing classical music from KDFC, and its selective bandwidth and muting control options, not present on the MAC7200, gave me more control over background noise on weaker stations. But this was a fine performance for the MAC7200; it gave the Day Sequerra a run for its money.

The AM tuner section's performance proved to be quite good, capturing 21 AM stations, but unless you're aiming to

7 See stereophile.com/content/quad-esl-2912-loudspeaker-measurements. JA measured the newer Quad ESL-2912 and wrote that the impedance was "basically identical to that of the ESL-2912's predecessor, the ESL-989 (reviewed by Larry Greenhill in November 2002."

8 See stereophile.com/content/revel-ultima-salon2-loudspeaker-measurements.

9 The Day Sequerra FM Reference was first manufactured in 1987. Production stopped by the late 1990s and its last upgrade was in 2014, yet it remains listed in Recommended Components because of its continued use in reviews.

measurements, continued

standard simulated loudspeaker,[2] was very small, even from the 8 ohm tap (fig.1, gray trace). The small-signal bandwidth with the volume control set to its maximum was flat up to 20kHz from all three output transformer taps and was down by 3dB at 90kHz. Channel matching was excellent and maintained at lower settings of the volume control. The receiver's reproduction of a 10kHz squarewave from all three taps (fig.2) was free from overshoot and ringing.

Fig.3 shows the effects of the treble and bass controls, set to their +12 and –12 positions compared with the response with the controls bypassed. While the maximum boost or cut at low frequencies was ±12dB, it reached ±15dB at high frequencies. Channel separation via the line inputs (not shown) was okay, at just below 70dB in both directions. The level of the McIntosh's noise floor depended on the volume control setting. With the control set to its maximum, a small number of low-level supply-related spuriae can be seen just above the random noise floor (fig.4). The wideband, unweighted S/N ratio, taken with the unbalanced inputs shorted to ground and the volume control set to its maximum, was 69.3dB, average of both channels, ref. 2.83V output from all three output taps into 8 ohms. Restricting the measurement bandwidth to the audioband increased the S/N ratio to 78.0dB, while switching an A-weighting filter into circuit improved it further to 80.6dB.

Figs.5, 6, and 7 plot the percentage of THD+noise in the MAC7200's speaker output from the 8 ohm tap into 8 ohms, the 4 ohm tap into 4 ohms, and the 2 ohm tap into 2 ohms. In each graph, the THD+N continues to drop as the power decreases below actual waveform clipping, due to the distortion lying beneath the noise floor and the fixed level of noise becoming

2 See stereophile.com/content/real-life-measurements-page-2.

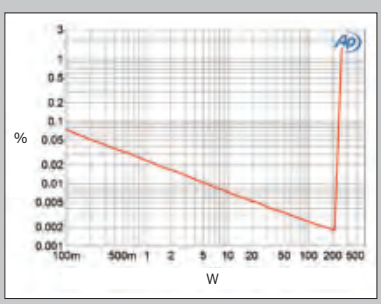

Fig.5 McIntosh MAC7200, 8 ohm tap, distortion (%) vs 1kHz continuous output power into 8 ohms.

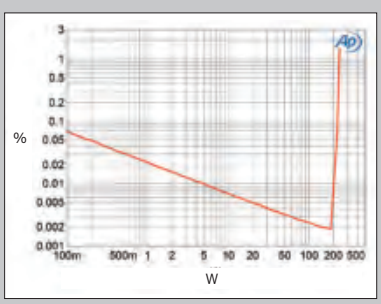

Fig.6 McIntosh MAC7200, 4 ohm tap, distortion (%) vs 1kHz continuous output power into 4 ohms.

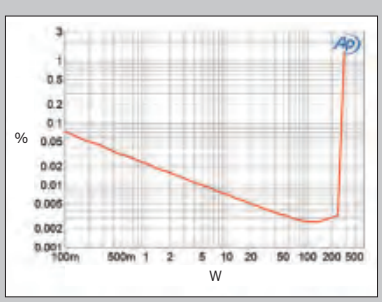

Fig.7 McIntosh MAC7200, 2 ohm tap, distortion (%) vs 1kHz continuous output power into 2 ohms.

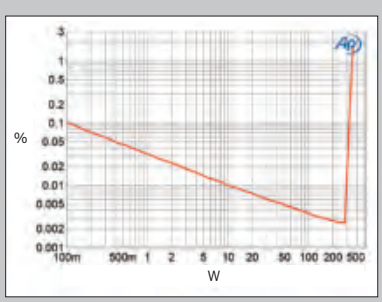

Fig.8 McIntosh MAC7200, 8 ohm tap, distortion (%) vs 1kHz continuous output power into 4 ohms.

listen to sports or political programming in the lowest fidelity, who cares?

The phono stage

With the MAC7200 placed on the floor, I had to move my Linn Sondek turntable from the top of my equipment rack to a lower shelf so that its interconnect cables could reach the receiver's MC phono inputs. The low-output Spectral Reference MC cartridge (0.2mV) suggested it might need a boost, but in the end it didn't: The sound was clean and dynamic, with great hall ambience, spacing, and three-dimensionality. Using the McIntosh remote, I was able to compare different impedance loading for my MC phono cartridge while playing a record. The 200 ohm loading gave the best results.

After first sampling an old well-worn disc and finding it too noisy to enjoy, I turned to a cache of unopened, unplayed vinyl. What am I waiting for, a rainy day? In California?

First up was the direct-to-disc vinyl recording, *Wagner-Die Walküre: Ride of the Valkyries / Tristan und Isolde: Prelude to Act I / Götterdämmerung: Siegfried's Funeral Music / Siegfried: Forest Murmurs* (Sheffield Lab, LAB-7), with Erich Leinsdorf conducting the Los Angeles Philharmonic. This has long been my go-to LP for dynamics, imaging, and rich orchestral tone, and the MAC7200 didn't disappoint. Next came a new copy of Eddie Daniels playing Brahms's Clarinet Quartet in B-Minor, Op.115, from *Brahms & Weber: Clarinet Quartets* (Reference Recording RR-40). As reproduced by the MC7200, the recording captured Daniels's instrument's full resonance.

My fun increased further when I sampled a previously unplayed copy of *Jeff Beck's Guitar Shop with Terry Bozzio and Tony Hymas*, playing "Behind the Veil" (Vinyl, Epic Records 463472-1). This fresh vinyl recording played with stunning transients, wide soundstage, and incredible detail. It easily bested my CD version.

My vinyl recording of Howard Dunn conducting the Dallas Wind Symphony in Owen Reed's *La Fiesta Mexicana* from *Fiesta!* (Reference Recordings, RR-38) delivered a warm, rich bassoon sound in the opening track—again, better than the CD version. Similarly, I reveled in the rich, full orchestral sound of Erich Leinsdorf conducting the Boston Symphony Orchestra in Prokofiev's Symphony No.2, Op.40 (RCA, LSC-3061).

The DA1 digital module

I was surprised how well the MAC7200's DA1 DAC performed. Livingston Taylor's cover of "Isn't She Lovely," from his *Ink* album (CD, Chesky JD162), was dynamic, transparent, involving, and holographic. I was bowled over by the 3D imaging of Ēriks Ešenvalds's *Translations* by the Portland State Chamber Choir, Ethan Sperry, conductor (CD, Naxos 8.574124; auditioned as 24/96 WAV). My other Ešenvalds recording, *Heaven's Door* (24/88.2 WAV file or CD, Naxos 8.579008), exhibited the same exceptional imaging when the MAC7200's DAC played "The First Tears."

Except on a few choral recordings, the MAC7200's DAC

measurements, continued

an increasing percentage of the signal level. The receiver's maximum power is specified as being at least 200W from each of the output-transformer taps. Using our definition of clipping, which is when the output's percentage of THD+noise reaches 1%, the 8 ohm tap clipped at 255W into 8 ohms (24dBW) with both channels driven, the 4 ohm tap at 235W into 4 ohms (20.7dBW) with both channels driven, and the 2 ohm tap at 283W into 2 ohms (18.5dBW) with one channel driven. More power was available when the load impedance was lower than the nominal tap impedance. For example, with its 8 ohm tap driving 4 ohms, the McIntosh clipped at 340W into 4 ohms (22.3dBW, fig.8).

I measured how the MAC7200's distortion changed with frequency at 20V output, which is equivalent to 50W into 8 ohms and 100W into 4 ohms. The THD+N percentage was very low into both loads (fig.9) and didn't increase at the top of the audioband. As suspected from the clipping graphs, the measurement was being dominated by random noise, which can also be seen in the waveform of the THD+N spuriae (fig.10). A hint of second harmonic can be just made out in this graph, which was confirmed by spectral analysis (fig.11). Intermodulation distortion was also vanishingly low (fig.12).

I primarily tested the McIntosh's phono input from the preamplifier output with the jumpers to the power amplifier inputs removed. The moving magnet and moving- oil modes both preserved absolute polarity at all outputs in all modes. The MM input impedance was an appropriate 45k ohms at 20Hz and 1kHz, dropping to 39.6k ohms at 20kHz. The MC mode's input impedance had been set to 200 ohms; I measured 200.7 ohms from 20Hz to 20kHz. With the volume con-

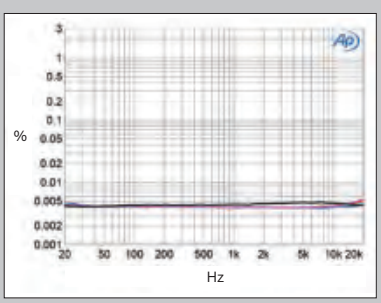

Fig.9 McIntosh MAC7200, 8 ohm tap, THD+N (%) vs frequency at 20V into 8 ohms (left channel blue, right red) and 4 ohms (left cyan, right magenta).

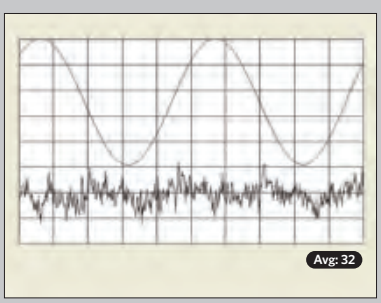

Fig.10 McIntosh MAC7200, 8 ohm tap, 1kHz waveform at 100W into 8 ohms, 0.0043% THD+N (top); distortion and noise waveform with fundamental notched out (bottom, not to scale).

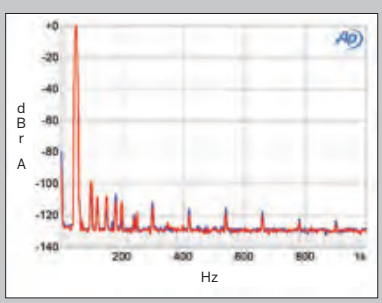

Fig.11 McIntosh MAC7200, 8 ohm tap, spectrum of 50Hz sinewave, DC–1kHz, at 100W into 8 ohms (left channel blue, right red, linear frequency scale).

matched the Bryston BDA-3's dynamics, background quietness, and depiction of the soundstage. Both revealed subtle details in the bass drum head—muffled but solid—which underpinned the chorus and soloist, Jose Carreras, in the "Kyrie" of Ariel Ramirez's *Misa Criolla*, conducted by José Luis Ocejo (CD, Philips 420 955-2), and discriminated different vocal details in the chorus. In their rendering of Patricia Barber's *Companion* (Premonition/Blue Note/Mobile Fidelity Sound Lab UDSACD 2023), the two DACs both depicted the rich, well-defined notes from Michael Arnopol's stand-up bass, the timbre of Barber's vocals, and the subtle adjustments in her Hammond organ described so well by JA in his review of the dCS Rossini Transport.[10]

The DA1 DAC also processed DSD native files streamed from my P50 laptop (using JRiver Media 26 software[11]) once I had downloaded and installed the "McIntosh-HD USB Audio Windows Drive D v2.0" driver to identify the MAC7200 as an audio output device. I streamed a DSD musical file of Art Lande's piano version of "Tenderly" from *While She Sleeps* (DSD64 and DSD128 downloads from Blue Coast Music) to the MAC7200's internal DAC. The sound of the piano was warm, immediate, but dynamic, and the front-panel display confirmed that the MAC7200 internal DAC was processing DSD files.

I also listen to KDFC-FM's "Classical California Ultimate Playlist" streamed from its website. Although free of FM noise and multipath, the digital stream did not have the dynamics, transparency, or soundstage imaging of the MAC7200's FM tuner or of PCM digital music files stored on my laptop.

Line section and amplifier stages

The MAC7200 refreshed my Quad ESL-989's, which delivered in turn a translucent upper midrange while reproducing the pipe organ's tenor and soprano ranks of pipes in Andrew Galuska's performance of Bossi's *Intermezzo*, from the compilation *Pipes Rhode Island* (CD, Riago CD-101). Like KR in his review of the NAD Master Series N33 streaming integrated amplifier,[12] I enjoyed the warm, well-defined pipe organ notes from the album's opening track, John Dunstable's *Agincourt Hymn* played by Patrick Aiken (Riago 101).

The MAC7200 painted a wide 3D soundstage for the male chorus on John Rutter's *Lord, Make Me an Instrument of Thy Peace* from *Requiem*, performed by Timothy Seelig and the Turtle Creek Chorale (CD, Reference Recordings RR-57CD), their distinct vocal timbres easily resolved. The ending of *Piè Jesu* conveyed intense sadness and hope, as soprano Nancy Keith's voice gradually ascended the scale as the pipe organ descended. The MAC7200's amplifier delivered the power and bass extension of the pipe organ, so much so that

10 See stereophile.com/content/dcs-rossini-transport-sacdcd-transport.

11 I had to select two settings in my laptop's streaming software, JRiver Media 26: "McIntosh HD-(ASIO)" and "1 × DSD in Native Format (requires ASIO and 1×DSD capable DAC)."

12 See stereophile.com/content/nad-masters-series-m33-streaming-integrated-amplifier-page-2.

measurements, continued

trol set to its maximum, the MM mode offered 55.7dB of gain at the preamplifier output and 84.8dB at the 8 ohm loudspeaker output. The MC mode offered 20dB higher gain.

The MAC7200's RIAA correction offered very low error (fig.13) and was well-matched between the channels. Channel separation via the phono input was good, at 70dB in both directions at all audio frequencies. The phono input's noise performance in MM mode was excellent, with unweighted audioband signal/noise ratios (ref. 1kHz at 5mV input signal) of 79.2dB (average of both channels). The ratios improved to 84.6dB when A-weighted. The higher gain in the MC mode reduced the S/N ratio; the unweighted wideband ratio ref. 1kHz at 500µV was 66.1dB and 83dB, A-weighted.

The MAC7200's phono input offered excellent overload margins, at >22.5dB ref. 1kHz at 5mV in MM mode and >20dB ref. 1kHz at 500µV in MC mode. The phono input's distortion was very low, primarily consisting of the second harmonic, but this lay at just –100dB (0.001%, fig.14). Intermodulation distortion via the MAC7200's phono input was also extremely low.

The McIntosh MAC7200's optical and coaxial S/PDIF digital inputs locked to data sampled up to 192kHz. Apple's USB Prober utility, running on my battery-powered MacBook Pro, identified the McIntosh as "McIntosh HD USB Audio\000 ..." from "McIntosh\000 ... ." The USB port operated in the optimal isochronous asynchronous mode, and Apple's AudioMIDI utility revealed that via USB the MAC7200 accepted 16-, 24-, and 32-bit integer data sampled at all rates from 32kHz to 384kHz.

With the volume control set to its maximum, a 1kHz digital signal at –20dBFS resulted in a level at the 8

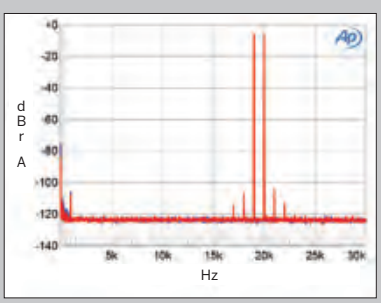

Fig.12 McIntosh MAC7200, 8 ohm tap, HF intermodulation spectrum, DC–30kHz, 19+20kHz at 100W peak into 8 ohms (linear frequency scale).

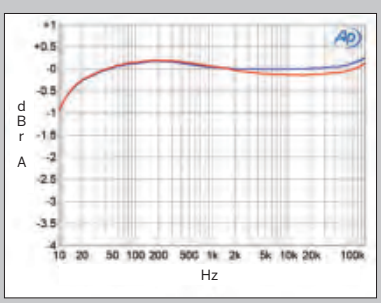

Fig.13 McIntosh MAC7200, phono input, MM mode, response with RIAA correction (left channel blue, right red, 0.5dB/vertical div.).

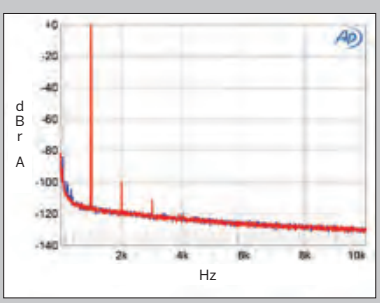

Fig.14 McIntosh MAC7200, phono input, MM mode, spectrum of 1kHz sinewave, DC–10kHz, at 10mV input (left channel blue, right red; linear frequency scale).

I had to reduce the volume as the electrostatic screens began to flap, or seemed to. The separate notes from harp, organ, and rich mix of voices on the album's final track, *A Gaelic Blessing*, could be differentiated easily. Similarly, Lyle Lovett's cover of the Grateful Dead's "Friend of the Devil," in the compilation *Deadicated* (CD, Arista, ARCD-8669), was played with a 3D, holographic image of the singer. The large conga drum that opens "Hotel California," from the Eagles' *Hell Freezes Over* (CD, Geffen GEFD-24725), was 3D, the drumhead tight, fast, deep, and massive. The ESL-989's midrange blossomed playing piano music. Keith Jarrett's "Part 7" from his 2006 *Carnegie Hall Concert* (CD, ECM Records B0007362-02) had both a warm piano timbre and tight, syncopated, rhythmic drive that had me tapping my foot and singing along. Wow!

I was shocked by the sudden crashing transients that open "2049" from Hans Zimmer and Benjamin Wallfisch's score for *Blade Runner 2049* (CD, Epic 19075800852), followed by eerie reverberant echoes and sustained new-age synth chords. The MAC7200 delivered the same explosive dynamics, beginning with a faint, staticky whine followed by crashing heavy-metal chords on another Hans Zimmer soundtrack, *The Dark Knight* (CD, Warner Sunset 511103-2)—specifically the track "Why So Serious?"

I enjoyed the line stage and amplifier's tubelike warmth and highly detailed imaging in the title track "Going Home" from a CD reissue of *The L.A. Four: Going Home* (CD, East Wind 32-JD-10043), which placed Laurindo Almeida's

ASSOCIATED EQUIPMENT

Analog sources Linn Sondek LP12 turntable with Lingo power supply & Ittok tonearm, Spectral MC cartridge; Bryston TF-2 30 MC step-up transformer; Day Sequerra 25th Anniversary FM Reference FM tuner.
Digital sources Bryston BCD-1 CD player, BDP-3 media player, BDA-3 DAC; Oppo Digital BDP-103 universal BD player; Lenovo P50 ThinkPad computer running Windows 10 Pro (64-bit), Roon Nucleus+ with Core V1.4 (build 300) stable (64 bit).
Preamplification Bryston TP-2 30 step-up transformer; Bryston BP-17^3, Mark Levinson ML-7.
Power amplifiers Mark Levinson No.534, ML2 monoblocks.
Loudspeakers KEF LS50, Revel Ultima Salon2, Quad ESL-989.
Cables Digital: Bryston 75 ohm BNC to RCA; Wireworld Starlight (coaxial). Interconnect: Bryston, Pure Silver Cable (balanced, XLR); Red Rose Silver One, Totem Acoustic Sinew (single-ended, RCA). Speaker: Pure Silver Cable R50 (biwire double ribbon).
Accessories JL Audio CR-1 electronic crossover; Apple iPhone 6 (iOS version 12); Studio 6 iTestMic & AudioTools v.10.7.11; Torus Power RM 20 power conditioner; Salamander Designs Synergy System Audio Core Module Equipment Rack.—**Larry Greenhill**

measurements, continued

ohm loudspeaker outputs of 34.64V into 8 ohms, which is equivalent to 150W into 8 ohms. As is often the case with integrated amplifiers with DACs, the MAC7200's digital inputs have too much gain. The –20dBFS digital signal resulted in a level of 1.252V at the preamplifier output and 2V at the headphone output. To avoid damaging the McIntosh's power amplifier stage with high-level digital signals, I performed all the measurements of the digital inputs' performance at the preamplifier output. As this output clips with full-scale digital signals with the volume control set to its maximum, I examined the behavior of the digital inputs with the volume control at 76%, a few dB below the setting at which the distortion started to rise. The preamplifier output level at this volume control setting was 3.15V.

The McIntosh's USB and S/PDIF inputs preserved absolute polarity. The impulse response with 44.1kHz data (fig.15) indicates that the reconstruction filter is a conventional linear-phase type, with time-symmetrical ringing on either side of the single sample at 0dBFS. With 44.1kHz-sampled white noise (fig.16, red and magenta traces), the MAC7200's response rolled off sharply above 20kHz, reaching full stop-band suppression just above half the sample rate (vertical green line). An aliased image at 25kHz of a full-scale tone at 19.1kHz (blue and cyan traces) is suppressed by more than 110dB, and though the distortion harmonics of the 19.1kHz tone can be seen, these are all very low in level. The second harmonic is the highest in level, at –90dB (0.003%). The MAC7200's digital-input frequency response was flat in

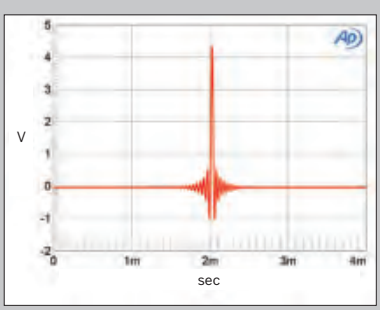

Fig.15 McIntosh MAC7200, digital inputs, impulse response (one sample at 0dBFS, 44.1kHz sampling, 4ms time window).

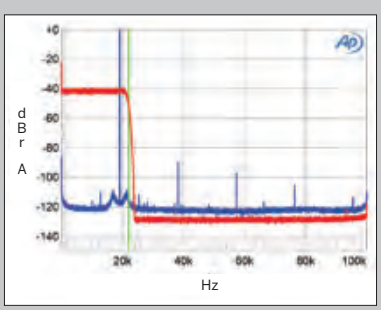

Fig.16 McIntosh MAC7200, digital input, wideband spectrum of white noise at –4dBFS (left channel red, right magenta) and 19.1kHz tone at 0dBFS (left blue, right cyan), with data sampled at 44.1kHz (20dB/vertical div.).

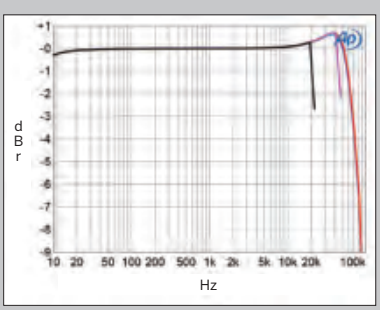

Fig.17 McIntosh MAC7200, digital inputs, frequency response at –12dBFS into 100k ohms with data sampled at: 44.1kHz (left channel green, right gray), 96kHz (left cyan, right magenta), 192kHz (left blue, right red) (1dB/vertical div.).

guitar to the left, Ray Brown's standing bass just left of center, Shelly Manne's drums slightly to the right of center, and Bud Shank's alto flute and saxophone far right.

Conclusions

The MAC7200 belongs in Class A of *Stereophile*'s Recommended Components list. Yes, its $7500 price makes it the most expensive stereo receiver available today, but its power, resolution, dynamics, and transparency are among the best I've heard. Its internal DAC's transparency, speed, and imaging provided strong competition for my Bryston BDA-3. The phono and line preamplifiers excelled in their versatility as well as delivering transparent midrange, tuneful bass, and open highs. The amplifier allowed the Quad Electrostatic 989s to play loud with great dynamics.

The FM tuner is this product's jewel. Its sensitivity, selectivity, and ability to quiet with an FM signal equaled and in many cases bettered my FM Reference tuner. This FM tuner's superb performance was not limited by multipath, as in Jim's case, but because there are so few FM fine music stations in my area of the country—and that's not the tuner's fault! Here in SF's North Bay region, it pulled in 17 FM stations well, but only one offered classical music, one other National Public Radio.

I will be sad to return the MAC7200. Its intuitive remote made it so easy and convenient to access high-quality FM radio, vinyl, and digital musical sources.

If you have the sturdy shelf space for its large, heavy chassis, are a fan of FM radio, and are looking for one unit to handle many different two-channel tasks, the MAC7200 should be on your short list. ■

measurements, continued

the audioband and follows the same basic shape, but with a slight peak just before the sharp rolloff at half of each sample rate (fig.17).

Channel separation via the digital inputs was a very good 90dB below 1kHz. When I increased the bit depth from 16 to 24 with a dithered 1kHz tone at –90dBFS (fig.18), the noise floor components dropped by around 18dB, which implies that the MAC7200 offers around 19 bits' worth of resolution. With undithered data representing a tone at exactly –90.31dBFS (not shown), the three DC voltage levels described by the data were well resolved. With undithered 24-bit data (also not shown), the result was a fairly clean sinewave.

Intermodulation distortion via the McIntosh amplifier's digital inputs was very low, but there was an odd scalloping of the noise floor either side of the twin tones at 19kHz and 20kHz (fig.19; this can also be seen in fig.16). This modulation of the noise floor was also evident when I tested the MAC7200 for its rejection of word-clock jitter via its S/PDIF and USB inputs, obscuring the odd-order harmonics of the 16-bit J-Test signal's LSB-level, low-frequency squarewave (fig.20).

Overall, the McIntosh MAC7200 performed very well on the test bench via its line inputs, exceeding its specified power and offering extremely low distortion. It also includes an excellent phono input that offers low noise and low distortion in both MM and MC modes. However, while the digital inputs offer excellent resolution, I was bothered by the modulation of the noise floor with high-level, high-frequency tones.[3] **—John Atkinson**

3 This scalloping of the noise floor is probably not audible as such. However, it is always suspect when a product's transfer function is modified by the signal.

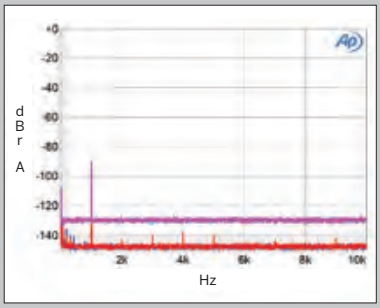

Fig.18 McIntosh MAC7200, digital inputs, spectrum with noise and spuriae of dithered 1kHz tone at –90dBFS with: 16-bit data (left channel cyan, right magenta), 24-bit data (left blue, right red) (20dB/vertical div.).

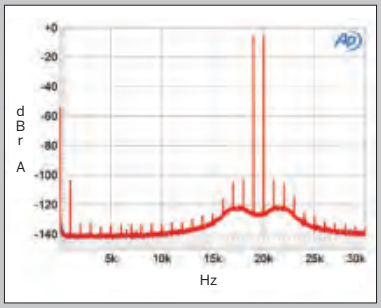

Fig.19 McIntosh MAC7200, digital inputs, HF intermodulation spectrum, DC–30kHz, 19+20kHz at 0dBFS peak (linear frequency scale).

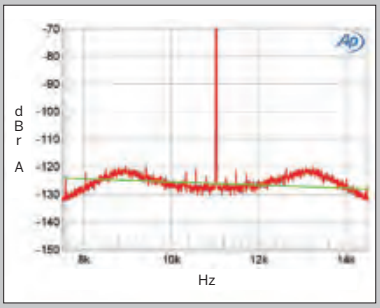

Fig.20 McIntosh MAC7200, digital input, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz: 16-bit Toslink data (left channel blue, right red). Center frequency of trace, 11.025kHz; frequency range, ±3.5kHz.