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NAKAMICHI OMS-7 COMPACT DISC PLAYER

Manufacturer's Specifications
Frequency Response: 5 Hz to 20 kHz, ±0.5 dB.
THD: 0.003% at 1 kHz.
S/N Ratio: Greater than 92 dB (IHF A-weighted).
Channel Separation: Greater than 92 dB.
Number of Programmable Selections: 24.
Output Level: 2.0 V.
Phone Output Level: 20 mW into 8 ohms.
Power Consumption: 33 watts.
Dimensions: 17⅛ in. W × 3-15/16 in. H × 12⅛ in. D (43.5 cm × 10 cm × 30.8 cm).
Weight: 16 lbs., 9 oz. (7.5 kg).
Price: $1,295.

Company Address: 19701 South Vermont Ave., Torrance, Cal. 90502.
For literature, circle No. 91

Nakamichi takes a cautious stand when it comes to new technology and new products. Best known for its pioneering work in cassette deck design and manufacture, the company now is entering broader fields of electronic endeavor, including such high-tech ventures as the production of a research instrument that can, among other things, record and play back music in CD format, on appropriate discs. This first optical memory system, capable of recording and reproducing a wide variety of optical recording media, is being made available strictly for laboratory research purposes—at a cost of $85,000!

I mention this research instrument simply to point out that Nakamichi does not introduce a new product category casually. They waited a long time to introduce their first CD player, hoping to benefit from the lessons learned by others whose first- and even second-generation CD players left something to be desired in terms of sonic and mechanical performance. As the Nakamichi people explain it in one of their well-written "white papers," they saw three major problems with most first-generation players. The first of these was the players' steep analog brick-wall filters and their attendant phase shift. The second flaw Nakamichi perceived was the use of time-sharing D/A conversion circuitry which introduces a small, but measurable, interchannel phase error. The third problem in early players, says Nakamichi, was poorly conceived drive systems, which had servos that were shock-sensitive and created an excessive error rate or even actual mistracking.

Nakamichi claims to have overcome all of these problems in their OMS-7 and in the less-expensive OMS-5. Digital filtering prior to D/A conversion, plus oversampling at a 176.4-kHz rate (four times the basic sampling rate of 44.1 kHz), allows them to use analog output filters which have a much gentler slope and which provide linear-phase filtration and constant group delay.

The OMS-7 also separates the channels prior to conversion—while they are in digital form—and then uses independent left and right D/A converters to overcome the interchannel phase-angle discrepancy noted earlier. Finally, the OMS-7 drive mechanism is mounted on a zinc-alloy diecasting suspended on coil springs, which floats free of the disc-

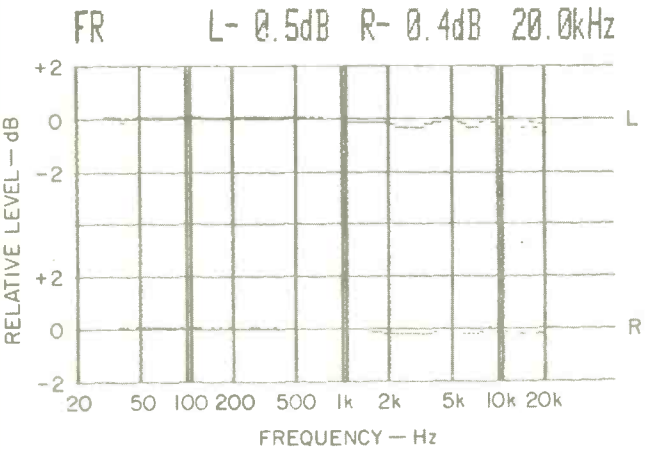

Fig. 1—Frequency response, left (top) and right channels.

loading mechanism and main chassis. A tapered, aluminum spindle centers the disc to reduce track eccentricity and error rate.

Control Layout

The OMS-7's power switch, phone level control, and phone jack are located near the left edge of the front panel. To their right is the disc drawer with its "Eject/Load" button. A display area to the right of the drawer provides detailed status information including track number being played, elapsed time (for each track), remaining time, tracks to be played, and index number. Additional indicators light up to

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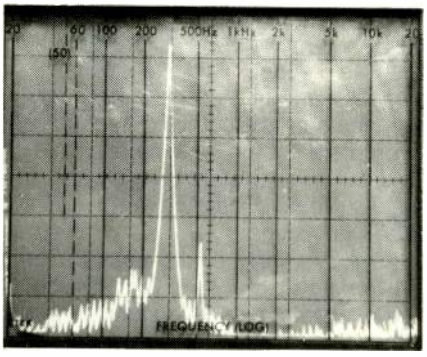

Fig. 2—Spectrum analysis from 0 Hz to 50 kHz shows 10-kHz test signal (large spike) and inaudible beat tone at approximately 24.1 kHz (small spike).

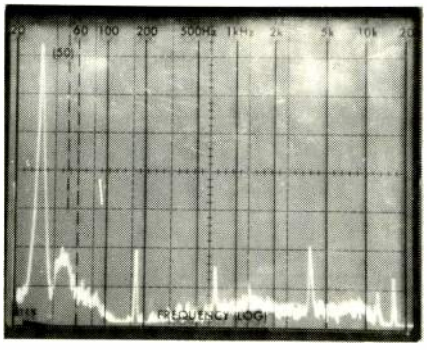

Fig. 3—Spectrum analysis from 10 to 100 kHz shows spurious products at the fundamental sampling frequency and at multiples of that frequency.

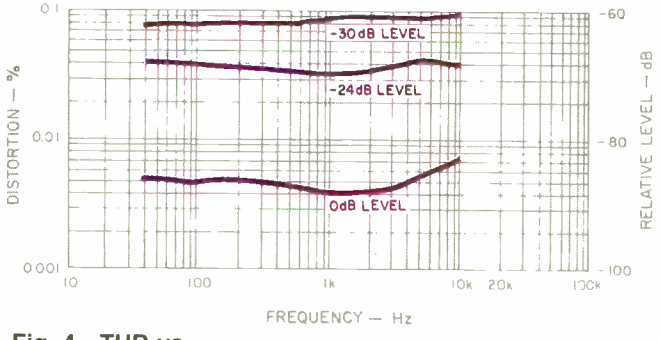

Fig. 4—THD vs. frequency, using low-pass filter, at three signal levels.

show that tracks or index numbers have been stored in the programming memory, that a disc has been loaded into the player, that the player is in standby mode (during track search or while the laser pickup is searching for the beginning of the first track), and when repeat playback has been selected.

Operating controls to the right of the display area have been very logically arranged. A large "Play" bar is at the top; below it are two smaller pushbuttons for "Stop" and "Pause." Below these are four still smaller buttons, two of which are used to skip forward or backward track by track, and two of which permit fast-forward or fast-reverse with audible cueing.

Ten numbered keys near the right end of the panel select track and/or index numbers. Below these are "Memory" and "Clear" buttons, plus four more pushbuttons to call up memory contents on the display, to control index search operations, to initiate repeat play, and to check remaining time and remaining number of tracks on a disc.

A wireless, hand-held remote-control module duplicates the main control functions of the player but does not have facilities for remote-controlled random-access programming; this can only be done via the front-panel numeric keys. In addition to the usual left- and right-channel outputs on the rear panel of the OMS-7, there is a multiple-pin socket which is identified as a "System Remote Terminal." This extra terminal, the owner's manual tells us, will serve for total system remote control when using the OMS-7 CD player with audio components to be introduced by Nakamichi in the future.

Measurements

Test-instrument measurements don't always correlate with listening tests, and the Nakamichi OMS-7 is a case in point if ever there was one. Not that the bench measurements were particularly bad—as with almost all CD players, my measured results were exemplary compared to those I get for analog components such as amplifiers and tuners. It's just that they were not quite as superb as the measurements I have gotten recently from other CD players. Yet, sonically as well as mechanically, I could not fault the Nakamichi in any way. In fact, its sound quality and resistance to shock were as good as any I have tested. The only quality which was marginally poorer than that of some top-of-the-line players I have tested was its tracking/error-correction capability, which I'll discuss a bit later.

Frequency response, shown in Fig. 1, was flat to within the claimed ±0.5 dB over the entire audio range. A small amount of ripple in the response curve can be seen, however, at the upper frequencies; it amounts to no more than about 0.3 dB. (Bear in mind that the vertical scale in Fig. 1 is 2 dB per major division.)

My first problem during the test-measurement phase of this evaluation had to do with harmonic distortion. When I tried to measure this parameter using a single-reading distortion analyzer, I was taken aback by the readings I obtained. When I introduced a low-pass filter (with a cutoff at around 20 kHz), I quickly realized that the supposed "distortion" wasn't harmonic at all, but consisted of ultrasonic "beats" well outside the audio range. These are shown in

The player had trouble with the widest portion of my test disc's opaque wedge, but not with its simulated dust spot or fingerprint.

the spectrum analysis photos of Figs. 2 and 3. In Fig. 2, the sweep extends from 0 Hz to 50 kHz. The large spike is the desired 20-kHz output, while the lower amplitude spike is a beat occurring at around 24.1 kHz. Using an even wider frequency sweep (from 10 to 100 kHz) in Fig. 3 reveals additional beats at the fundamental sampling frequency and at multiples of that frequency. I would have thought that, with the digital filtering and oversampling techniques used in this player, such beats would not be present. They did not introduce any intermodulation or spurious products *within* the audio range; it just seems odd that they are there. I am wondering if they are the result of the presence of multiple "timing clocks" which govern the oversampling rate in various integrated circuits within the player's D/A circuitry.

When I introduced a low-pass filter into the THD measurement chain, the actual THD readings within the audio band were, of course, more like the value claimed by Nakamichi, as shown in Fig. 4. Unweighted signal-to-noise ratio measured a very good 95.7 dB, and the A-weighted measurement was an even better 100.0 dB (see Figs. 5A and 5B). SMPTE-IM distortion measured 0.01% at maximum recorded level, increasing to 0.1% at −20 dB recorded level. CCIR IM (twin-tone, using 19- and 20-kHz tones at the equivalent of highest recorded level) measured a very low 0.0037%. Stereo separation, plotted as a function of frequency in Fig. 6, ranged from 76.2 dB at the high frequency extremes to 87.2 dB at mid-frequencies.

Reproduction of a 1-kHz square wave by this player is shown in Fig. 7. As has been true of other CD players employing digital filters and oversampling, the waveform exhibits no ringing, only a slight ripple along its top and bottom edges. This denotes the absence of higher order harmonics above the 20-kHz audio bandwidth. The appearance of the unit pulse in Fig. 8, as reproduced from my Philips test disc, further confirms the use of digital filtering and oversampling in this player's D/A circuitry.

The OMS-7 fell just short of being able to play through the widest section of the opaque wedge on my special "defects" test disc. During play I heard occasional ticks, indicating that the player was unable to correct or conceal over that 900-micron width of missing data. On the other hand, the player had no trouble playing through the widest simulated dust particle on the test disc, a black dot 800 microns in diameter. Neither did it misbehave at any time while playing through the test disc's simulated, semi-opaque fingerprint smudge.

Use and Listening Tests

The Nakamichi OMS-7 exhibits the kind of smooth, natural sound I have come to expect from CD players employing the advanced digital filtering and oversampling techniques which now are gaining favor with most CD hardware manufacturers. Gone is the unstable stereo imaging of some of the earlier players, as well as what some astute listeners sensed as a somewhat grainy high end. I want to stress that the kinds of audible differences I am talking about here are certainly not great. The casual listener will hear little if any difference between first-, second- and third-generation CD players. They all sound much better, overall, than other program sources. But to an experienced and critical listen-

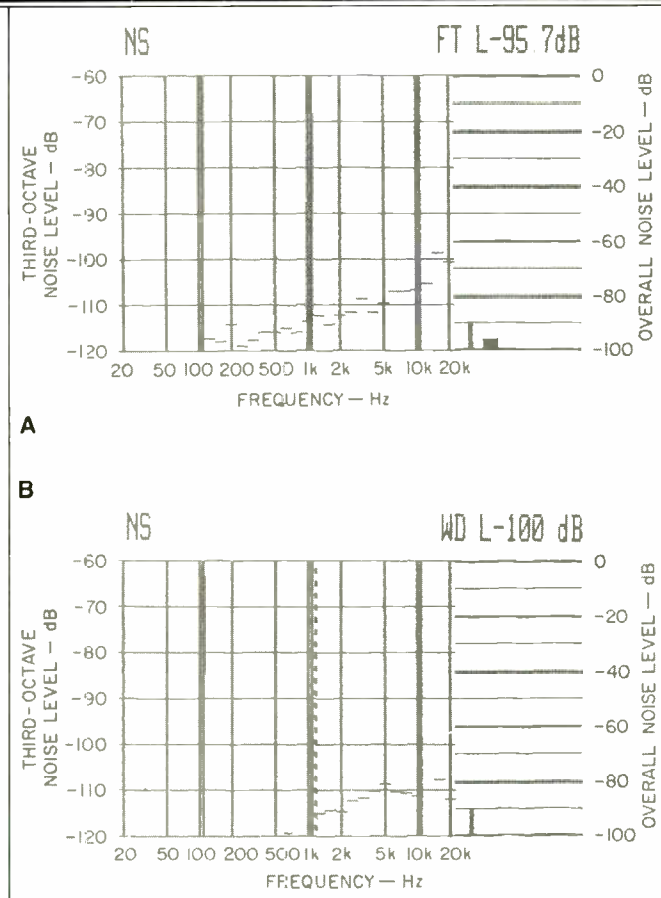

Fig. 5—S/N analysis, both unweighted (A) and A-weighted (B).

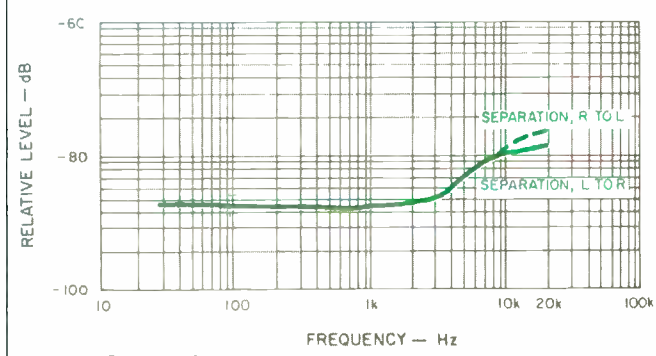

Fig. 6—Separation vs. frequency.

To an experienced and critical listener, the improvement in sound of this and other recent players will be apparent and very worthwhile.

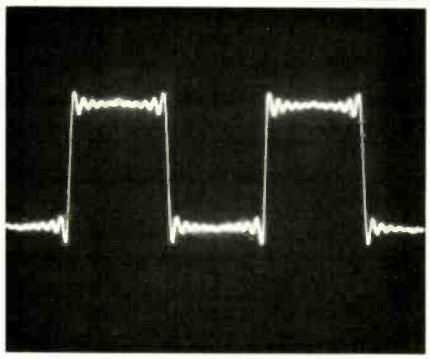

Fig. 7—Square-wave reproduction, 1 kHz.

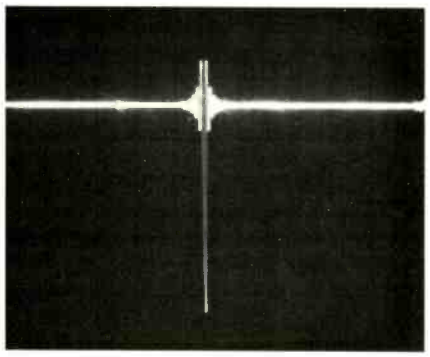

Fig. 8—Single-pulse test.

er, the sonic improvement of this and other recently introduced players is apparent and very worthwhile.

From a purely scientific point of view, I am somewhat troubled by those ultrasonic signal components I detected during the bench tests—but as a listener, I must report that these out-of-band components in no way degraded the musicality of reproduced sound from my favorite CDs. In that connection, if you are a lover of classical recordings, try any of the six discs from Denon which make up a complete set of Beethoven's nine symphonies, performed by the Staatskapelle Berlin Orchestra under the direction of Otmar Suitner. Or, for some real dynamics and musical fun, listen to Telarc's *Ein Straussfest*—a collection of waltzes, polkas and marches of the prolific Strauss family, replete with popping champagne corks, pistol shots, aerial bombs and thunderclaps. If you play this Telarc disc when checking out the OMS-7 or any other CD player, be sure to observe the warning in the album notes about starting out at lower levels for initial playback until a safe level can be determined for the rest of your audio equipment!

Programming the OMS-7 was easy to do and was almost self-explanatory from looking at the front panel. Being able to move the pickup to a specified index point was also a welcome feature, particularly since more and more classical discs are being divided into indexed portions as well as track numbers. In terms of convenience features, it might have been nice if the remote-control unit supplied with the OMS-7 had been able to program selections into memory, considering the player's relatively high price. However, the functions that *can* be performed remotely all worked perfectly, even at distances greater than those specified in the owner's manual.

Nakamichi did not rush into the CD marketplace with just any series of players. The OMS-7 clearly demonstrates the wisdom of the company in waiting until they could do it right.

Leonard Feldman