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NAKAMICHI ZX-7 CASSETTE DECK

Manufacturer's Specifications
Frequency Response: 20 Hz to 20 kHz, to 21 kHz with metal tape.
Harmonic Distortion: 0.8% at 0 dB.
Signal/Noise Ratio: 72 dBA with Dolby C NR.
Separation: 37 dB.
Crosstalk: 60 dB.
Erasure: 60 dB.
Input Sensitivity: Line, 50 mV.
Output Level: Line, 1.0 V; headphone, 45 mW at 8 ohms.
Flutter: ±0.08% wtd. peak.
Dimensions: 17¾ in. (450 mm) W x 5-5/16 in. (135 mm) H x 11-13/16 in. (300 mm) D.
Weight: 21 lbs. (9.5 kg).
Price: $1,250.00.

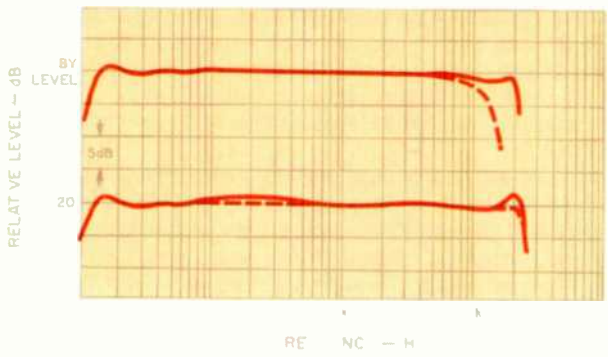

Fig. 1—Frequency responses with Nakamichi EXII tape with and without (---) Dolby C NR.

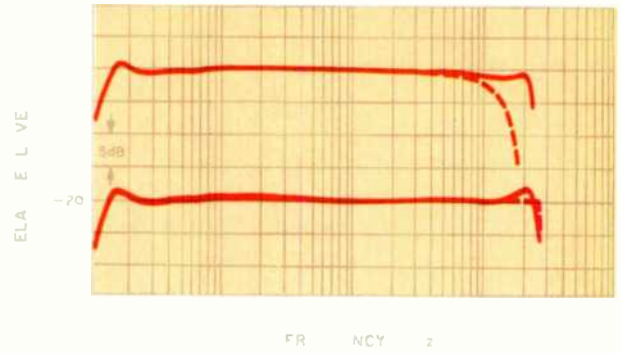

Fig. 2—Frequency responses with Nakamichi SX tape with and without (---) Dolby C NR.

The ZX-7 is a very worthwhile addition to Nakamichi's line of premium cassette decks, and it has a host of useful features. Of particular note are the built-in calibration facilities for setting bias, record level, and record-head azimuth; the Dolby C NR; an automated up/down fader; a microprocessor control, and the 50-dB record-level metering. The front panel is solid black with the exception of the white designations, which are easily read with any sort of lighting. The 32 horizontal LED-bar level meters (16 for each channel) are at the top, in the center, covering from −40 to +10 for level monitoring and from −20 to +4 for the calibration mode. This is an excellent scheme, not only for the wide range covered, but for the increased resolution for the calibration process.

Pushing *Level* when in record/pause mode initiates calibration. This button, and many others on the front panel, are wide bars with angled and grooved fronts, making for easy actuation. They all have status lights, which are needed since these microprocessor inputs do not have locking positions. The calibration requires the selection of tape type and 70- or 120-μS EQ. Under each of the three tape-type switches are L & R trim pots for record-level setting and for bias. Adjustments are easily made with the small knobs, and slip-over covers forestall diddling by the curious Status indicators with each set of pots show which ones should be adjusted for the desired display. Before *Level* is set, *Azimuth* is adjusted, and a three-LED display gives immediate and direct indication of any need to turn the record-head azimuth-adjust knob. Finally, *Azimuth* is released, *Bias* is selected, and the corresponding trimmers are used to get a zero meter indication for both channels. A push of *Reset*, and the deck does a fast rewind to the tape location where calibration started.

The tape-motion button switches are light touch but still have a nice snap-action when pushed. The microprocessor gains some extra functions, including two-speed cueing, flying-start recording, and auto play from either wind mode. *Rec Mute* is also provided with a separate momentary-contact switch. Five rotary switches with small bar knobs select memory or timer functions; 70- or 120-μS EQ; Dolby NR Type B, Type C, or off; multiplex filter on/off, and monitor, tape or source. There are separate L and R record-level pots and an output-level pot, all with medium-size knobs with good knurling.

An unusual feature of this Nakamichi deck is the automated master fader. When in the record mode, a simple push on the left side of its control bar starts an automatic fade of the level in both channels. With a light push, the fade takes about six seconds. A heavier push, which gets an additional click from the switch, results in a two-second fade. Fading up is done the same way by pushing on the right side of the bar. Two wide-bar LEDs above show where the fader is at any time by their brightness. Starting calibration causes an automatic down fade, and *Stop* in record mode results in an immediate up fade—both niceties of the total scheme.

The cassette compartment door contains a small lamp which provides good illumination of the tape pack. The eject button switch is the same design as that for power on-off and is just below it, which might cause a little confusion at times. The four-digit LED-type counter and its reset button are just above. It is quite easily read and has very good resolution but is rather displaced from the tape-motion controls. The phone jack for stereo headphones completes the front-panel features.

On the back panel are the line in/out phono jacks and two DIN-type sockets: One for the optional remote control and the other for the Nakamichi BlackBox accessory series, which includes the MX-100 microphone mixer. Removal of the top and side cover revealed three large p.c. boards, each with excellent soldering. All parts were indentified, and adjustments also had function labels. The transport system appeared to be well constructed, and the positioning of the head assembly under the control of the motor-driven cam was fast and non-jarring.

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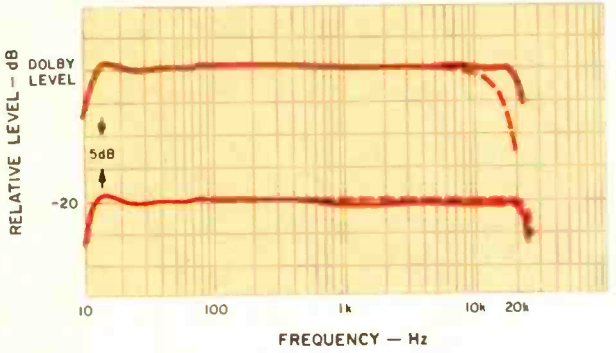

Fig. 3—Frequency responses with Nakamichi ZX tape with and without (---) Dolby C NR.

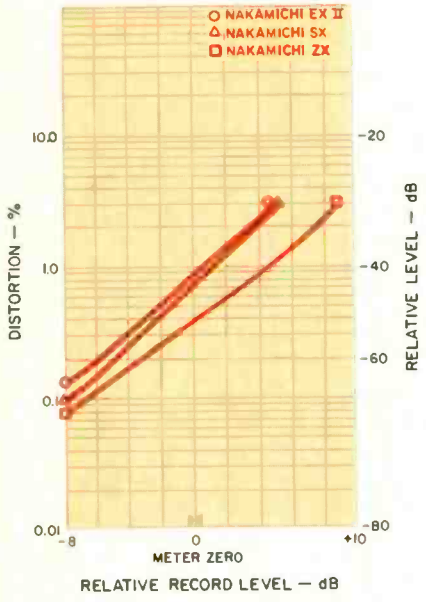

Fig. 4—Third harmonic distortion vs. level at 1 kHz with Dolby C NR.

Measurements

The playback responses were checked for both equalizations, and they were excellent. This was particularly noticeable at 70 μS with a new BASF test tape, with only two points as much as 0.8 dB off and most within ±0.2 dB! Play speed was very accurate, within ±0.05%. Playback of a standard-level test tape gave the correct indication, within the resolution of the LED meter display. A fast check of the record/playback responses at −20 dB was made using pink noise and a ⅓-octave RTA. Close to 30 different formulations were tried with Dolby B, Dolby C and without NR—following the normal calibration procedure with each tape. Only two tapes couldn't be matched, and they both were "cheapo" low-bias types. All of the detailed testing that followed was done with the Nakamichi samples provided with the deck, but I did note that the fast-check results were especially fine with BASF Professional II, Sony UCX-S and TDK SA-X.

The tests with each tape started with azimuth alignment and level and bias set. Record/playback with a 10-kHz tone showed that interchannel phase was within ±5° at that frequency—superb results. Phase jitter was 15° total at most, also excellent. Swept responses were run at Dolby level and 20 dB below that both with Dolby C and without NR. The plots are shown in Figs. 1 to 3, and the −3 dB limits are listed in Table I. The extension of high-frequency headroom with Dolby C is apparent in all cases—a most worthwhile improvement. Dolby tracking at the lower level was excellent, and the slight peak at 20 kHz with EXII and SX should not be considered significant. With the exception of those peaks, the plots are within ±1.5 dB from less than 15 Hz to at least 20 kHz, *even at Dolby level*.

The output polarity was the same as the input, whether in *Source* or *Tape*. The record sensitivity controls (*Level*) had a range of ±4 dB at 400 Hz. The bias controls had a range from −20 to over +5 dB with SX tape. With the multiplex filter in, the response was down 3 dB at 16.5 kHz and 31.6 dB at 19 kHz. Bias in the output during recording was minuscule. The 400-Hz (393-Hz actual) and 15-kHz (14.7-kHz actual) oscillators evidenced some distortion, but it was quite acceptable for the intended uses. Erasure of metal tape at 100 Hz was 69 dB, separation at 1 kHz was 43 dB, and crosstalk was down over 80 dB. All of these figures are excellent and also better than those specified by Nakamichi.

Measurements were made of the third harmonic distortion at 1 kHz with Dolby C NR over a range of levels, up to the point where HDL_3 = 3%. The results were fine for all tapes, especially so with the ZX metal tape, as shown in Fig. 4. HDL_3 was also determined with recording 10 dB below Dolby level from 30 Hz to 7 kHz, also with Dolby C NR and ZX tape. Take note of the fact that the distortion was less than 0.1% from 50 Hz to 3 kHz—quite impressive.

The signal-to-noise ratios were measured with and without Dolby C NR for all three tapes with both IEC A and CCIR/ARM weightings. Table II lists all of the results, with references to both Dolby level and the 3% distortion limit. The low noise obtained with Dolby C NR is quite evident, and the high S/N ratios for ZX tape are indicative of the excellent magnetic design of the deck.

The line input sensitivity was 48 mV, and the input overload was at least 22 V. The input impedance was about 47 kilohms at midband with the input pots centered. Output clipping appeared at a level equivalent to +17.4 dB relative to meter zero. The automated master fader introduced at least 65 dB of attenuation. Line outputs were 980 mV with a 0-dB indication, and they fell to 800 mV with a 10-kilohm load, indicative of the 2.2-kilohm source impedance. The headphone output was 52 mW with 8-ohm loading, and high volume levels could be obtained from all of the headphones tried. The output pot sections tracked within a dB from maximum down for about 45 dB, quite acceptable for

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this purpose. The level meter response times were very close to the IEC standard for peak program meters, both for charge and decay. In general, the meter scaling was quite accurate, but there were some points that were wayward by a dB or so. The frequency response of the metering was 3 dB down at 26 kHz at the high end and at about 28 Hz on the low end; this seems a bit far for meters to be off on a recorder with response to 11 Hz.

Tape play speed was very steady, and it did not vary with changes in line voltage. Flutter was consistent throughout the lengths of various cassettes, and there was little change from one sample to the next. On a weighted-peak basis, the flutter was ±0.07%, and it was ±0.05% or less weighted rms. Wind times for a C-60 were 55 seconds. Response times for changes in transport mode, including run-out to stop, were always less than a second, and there was loose-loop take-up with the insertion of the cassette.

Use and Listening Tests

Loading/unloading was smooth and easy, and the in-door lamp helped in observing the tape. Maintenance tasks were most easily performed with the clear cover removed and the door half closed. All controls and switches were completely reliable throughout the testing cycle. It was pleasing to have flying-start recording and auto play with wind added to the list of features. The automated master fader was used to good effect a number of times. It worked very well for fading in musical introductions, as well as fading out applause at the end of a performance. By pushing the control bar harder, it was most easy to speed up a slow fade for a final cutoff. This feature has extra value on the ZX-7 because of the separate record-level pots. The scheme also allows keeping the record-level setting for the next piece.

The LED-bar level indicators were quite easy to read under a wide range of light levels. Peak levels could be set very quickly, and the intensity of the top-most LED gave accurate indication of even very short peaks. The advantage of their wide level range was immediately obvious with the recording of classical music, where initial settings had to be made at −30 dB. The calibrations were straightforward and took little time, and rewind with *Reset* was of definite help. The expanded scale for this process is an essential part of this successful scheme.

The owner's manual has excellent text and illustrations. It contains good calibration instructions, a list of recommended tapes, and many helpful notes.

Listening tests included sources ranging from pink noise to virgin discs. The records were primarily from Mobile Fidelity (such as *Days of Future Passed* by The Moody Blues) and dbx (Empire Brass Quintet and *Baroque Brass* from Sine Qua Non). The Dolby tracking was excellent, and only the slightest shifts could be detected with purposely high reproduction levels. The advantages of Dolby C NR showed up both at high levels in the high-frequency region and at low levels, particularly with the low-noise dbx-encoded discs.

Record, pause, and stop sounds were all well down into tape noise. *Rec Mute* was used to advantage a few times. Timer start put the deck into play or record mode, as selected, after a delay of several seconds following the initial transients with turn-on. This Nakamichi deck does lack microphone inputs, but that is easily rectified with a small investment. The calibration functions are not automatic as in some decks, but their manual character allows the user to trim responses as desired. Many times improved Dolby tracking can be gained with some minor "deviations." Beyond this, the ZX-7 offers other valuable features and excellent to outstanding performance in all areas. For the high-level audiophile or the laboratory/studio professional, it has much to offer for its premium price.

Howard A. Roberson

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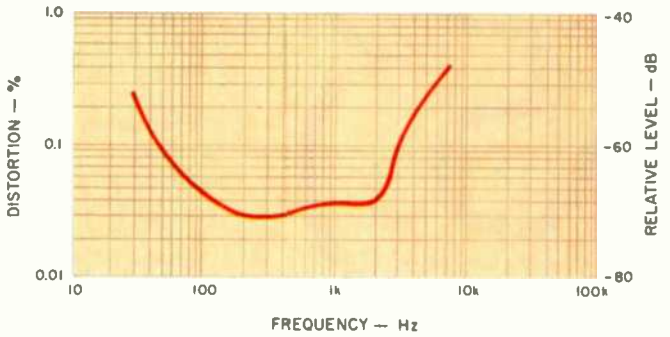

Fig. 5—Third harmonic distortion vs. frequency with Dolby C NR at 10 dB below Dolby level using Nakamichi ZX tape.

Table I—Record/playback responses (−3 dB limits).

	With Dolby C NR				Without Dolby NR			
	Dolby Lvl		−20 dB		Dolby Lvl		−20 dB	
Tape Type	Hz	kHz	Hz	kHz	Hz	kHz	Hz	kHz
Nakamichi EX II	12	20.7	11	25.2	12	11.6	11	25.7
Nakamichi SX	12	20.4	11	24.8	12	10.3	11	25.6
Nakamichi ZX	11	22.2	11	25.6	11	14.3	11	26.4

Table II—Signal/noise ratios with IEC A and CCIR/ARM weightings.

	IEC A Wtd (dBA)				CCIR/ARM (dB)			
	W/Dolby NR		Without NR		W/Dolby NR		Without NR	
Tape Type	@ DL	HD=3%	@ DL	HD=3%	@ DL	HD=3%	@ DL	HD=3%
Nakamichi EX II	65.3	69.6	50.0	54.0	66.3	70.6	47.0	51.0
Nakamichi SX	67.6	72.1	51.6	55.8	70.4	74.9	51.1	55.3
Nakamichi ZX	67.0	75.3	51.5	59.7	67.8	76.1	49.6	57.8