

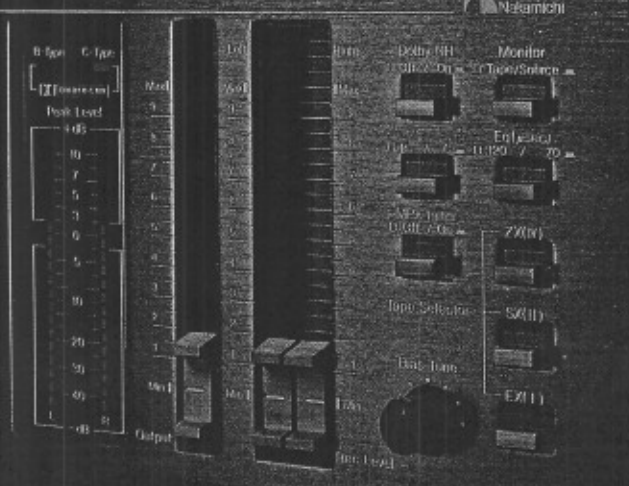
Nakamichi

BX-300 Discrete Head Cassette Deck

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Two-Head, Double-Deck, Microprocessor Control
Discrete 3 Head



BX-300—Flagship of the BX Series Simplicity and performance carried to a logical conclusion.

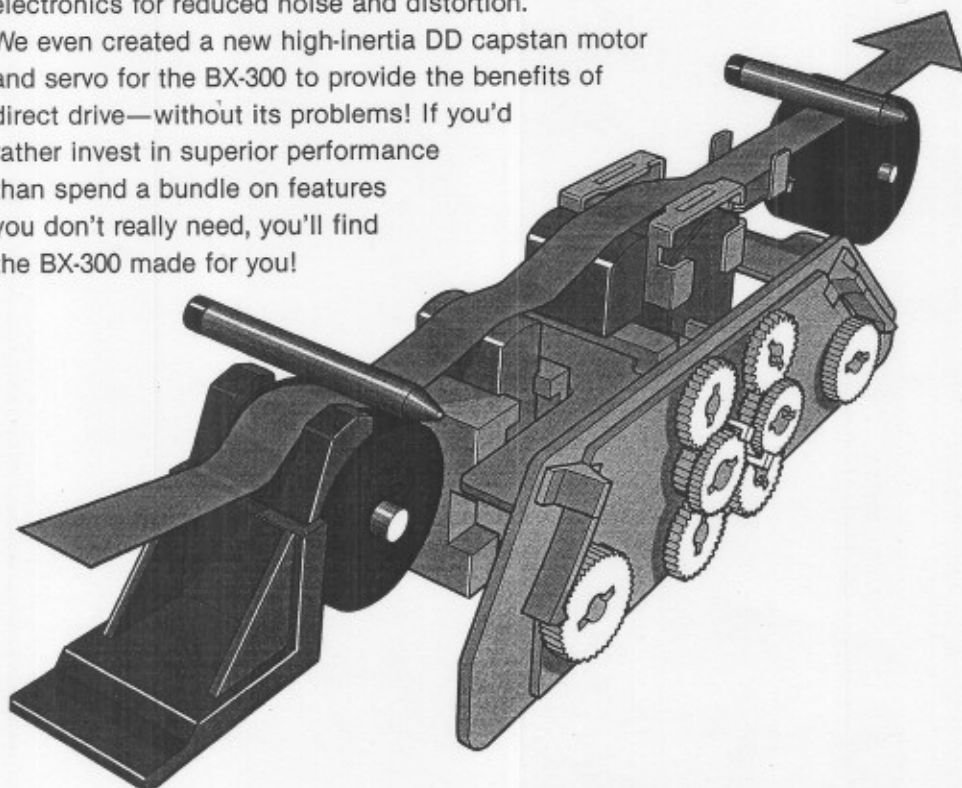
Around the world, Nakamichi has a reputation of being a "different" company—a company committed to a specific philosophy. Indeed, this is true.

We *are* committed to a philosophy of excellence in recorded sound and have always been unwilling to compromise sound quality for *any* reason.

This philosophy gives birth to such exotic decks as DRAGON—unquestionably the most perfect cassette recorder ever created—and the UDAR-equipped RX-Series decks that provide auto-reverse convenience *without* auto-reverse problems. The same philosophy permeates the economical decks of the BX Series and reaches its culmination in the BX-300—quite possibly the most "cost effective" deck in terms of sheer sound quality ever created.

The BX-300 incorporates a wealth of original Nakamichi Technology including the Discrete Three-Head Recording System that guarantees 20—20,000 Hz ± 3 dB response, perfect *magnetic* azimuth alignment, and maximum MOL; the Asymmetrical Dual-Capstan Diffused-Resonance Transport that eliminates the need for pressure pads and intracapstan guides and so has remarkably low scrape flutter and modulation noise for superior sound clarity; and Nakamichi-quality electronics for reduced noise and distortion.

We even created a new high-inertia DD capstan motor and servo for the BX-300 to provide the benefits of direct drive—without its problems! If you'd rather invest in superior performance than spend a bundle on features you don't really need, you'll find the BX-300 made for you!



The Discrete Three-Head Perfect Magnetic Azimuth Ensures 20—20,000 Hz

A "3-head" deck *should* be better than a 2-head deck because separate record and play heads can be individually optimized. A wide recording gap ensures full tape utilization for optimum MOL while a narrow playback gap resolves high frequency recordings. A 3-head deck also allows off-tape monitoring so you can check quality as you're recording. But beware—all 3-head decks are not the same!

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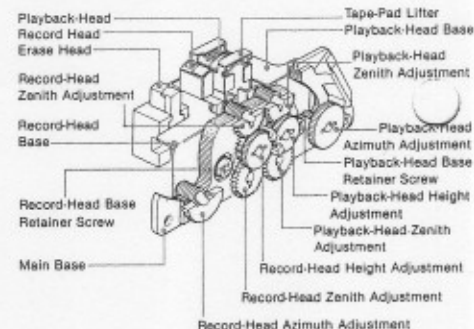


Figure 1 Discrete 3-Head Mounting Arrangement

To Nakamichi, "3-head" means three *discrete* heads—*physically* independent heads that are perfectly optimized and magnetically aligned *after* installation to ensure flat response, maximum headroom and minimum noise at *all* frequencies.

Our recording and playback heads are *individually* shielded to eliminate crossfeed and noise pickup. They are

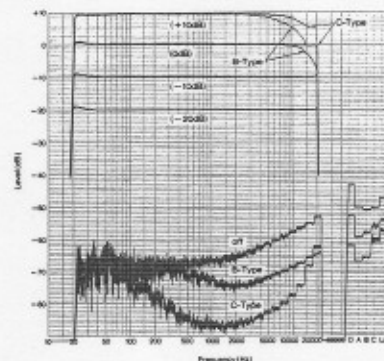
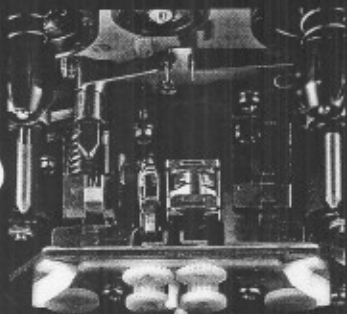


Figure 2 BX-300 Frequency Response/Noise Analysis

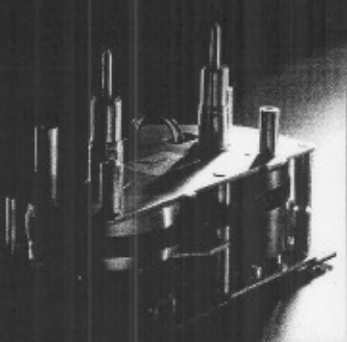
Deck: BX-300/ Tape: ZX (Metal)/ PB Eq: 70 μ s/ MPX Filter: off

STEREO



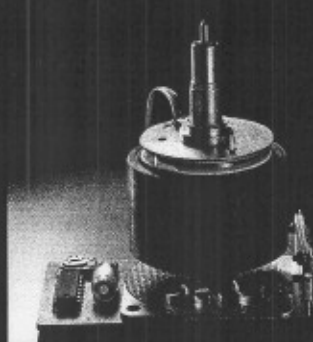
Discrete 3-Head System

The original Nakamichi technology that guarantees flat response from 20 to 20,000 Hz, perfect magnetic azimuth alignment and optimum MOL.



Asymmetrical Dual-Capstan Transport

Another Nakamichi innovation that dramatically reduces scrape flutter and modulation noise to reveal hitherto unheard detail.



Direct-Drive Capstan Motor

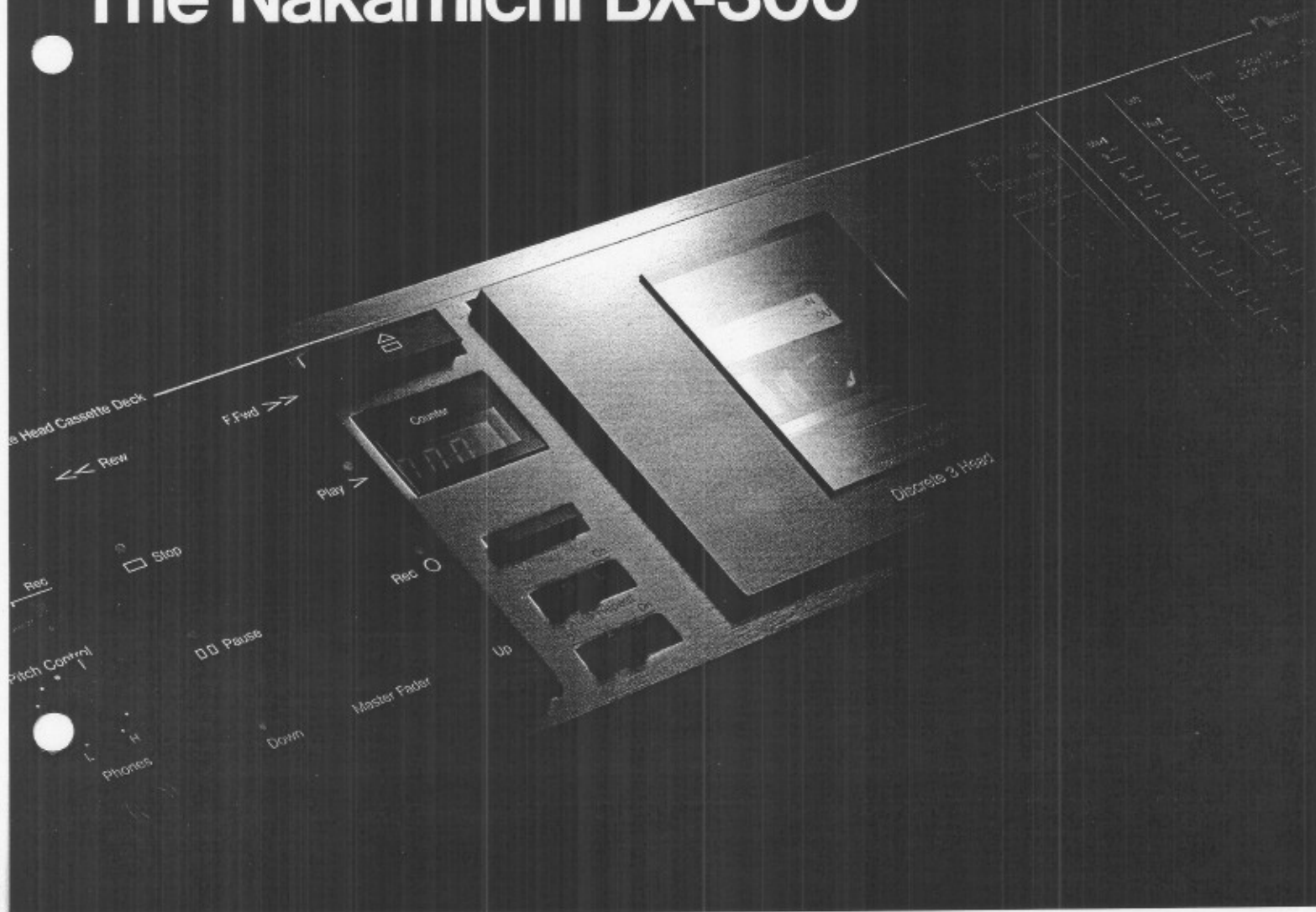
A newly developed high-performance direct-drive capstan motor virtually eliminates "conventional" wow and flutter.



Low Distortion Electronics

BX-300 electronics are on a par with the finest separate preamps. Distortion is under 0.005% and noise is virtually absent.

The Height Of Precision Is Within Your Reach The Nakamichi BX-300



System— h Alignment Response.

individually adjustable in height, azimuth, and zenith to ensure perfect tracking, magnetic alignment and tape contact. Our mounting system (Figure 1) is unusually sophisticated and allows non-interacting adjustment of *each* parameter for *each* head *after* installation. The results (Figure 2) speak for themselves!

More than 30 years' experience culminate in the BX-300 heads. During that time, Nakamichi pioneered the search for better magnetic materials, created the unique designs that launched the cassette as a high fidelity recording medium, and developed proprietary manufacturing processes that avoid internal stress in the core material and thereby preserve its magnetic properties to the fullest. Our special surface geometry ensures uniform wear and gives our heads a service life of over 10,000 hours!



• **P2H-3L Playback Head:** With a 0.8-micron gap and low-loss laminated-Crystalloy core, the P2H-3L provides smooth response to 20 kHz. A special hyperbolic geometry virtually eliminates "contour effect" so response is uniform to the lowest frequencies.

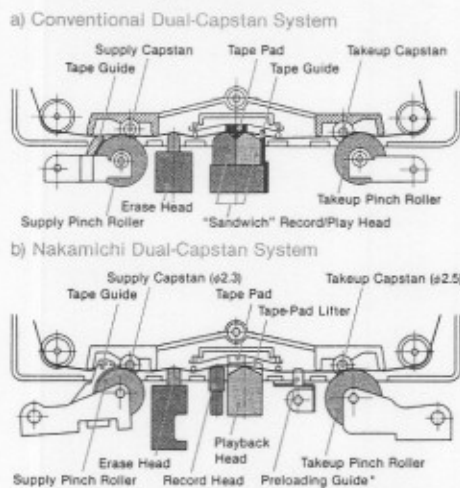
• **R-3L Recording Head:** The R-3L's 3.5-micron gap produces an extremely sharp critical zone for maximum high-frequency response and MOL. Its laminated-Crystalloy core easily handles the bias needed to record high-coercivity metal tape and ensures exceptional dynamic range.

• **E-4F Erase Head:** With two erasing gaps, a low-loss ferrite core and high-saturation sendust poletip, the E-4F ensures complete erasure for perfect sound clarity.

Asymmetrical Dual-Capstan Diffused-Resonance Transport Eliminates Scrape Flutter And Modulation Noise.

Just as a 3-head deck *should* be better than a 2-head deck (but many aren't!), a closed-loop dual-capstan transport *should* have less wow and flutter than a single-capstan transport. Many do not! *All dual-capstan transports are not the same!*

Most dual-capstan decks use identical capstans for supply and takeup. They rotate at the same rate and concentrate wow at specific frequencies making it much more audible. Tape tension within the "closed loop" isn't constant—so a pressure pad is used to maintain tape-to-head contact. With a pressure pad, tape-to-head contact becomes erratic, and, unless the pad is perfectly oriented (a matter of luck), the tape skews causing mistracking and azimuth error. Thus an intracapstan guide is needed.



*The preloading guide positions the tape as the pinch roller pulls in. As the roller engages, it lifts the tape away from the guide and the dual-capstan system maintains tracking from then on.

Figure 3 Tape Path In A Dual-Capstan System

After years of research, Nakamichi created the "Asymmetrical Dual-Capstan Diffused-Resonance Transport"—the *only* mechanism that eliminates coherent wow and exercises such precise control that *neither pressure pad nor intracapstan guide are required.*

The pad and guide have audible effects. As the tape passes them, it vibrates causing "scrape flutter" and "modulation noise" which destroy sound clarity. Modulation noise varies with recording level so it's not suppressed by noise-reduction systems. In fact, *the perceived quality of digital recording is largely due to the absence of modulation noise.* Removing the pad and guide virtually eliminates scrape flutter and modulation noise and allows music to emerge with digital-like transparency.

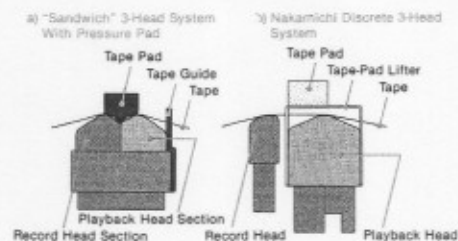


Figure 4 Closeup View Of Head Contact Area

Figures 3 and 4 compare the BX-300 transport with a conventional design. As you can see, in the BX-300, *nothing* contacts the tape except the heads themselves!

To eliminate coherent wow, the transport is "asymmetric"; capstans are of *different* diameter and rotate at different rates so they don't resonate and concentrate wow at specific frequencies. Again, the results—shown in Figure 5—speak for themselves!

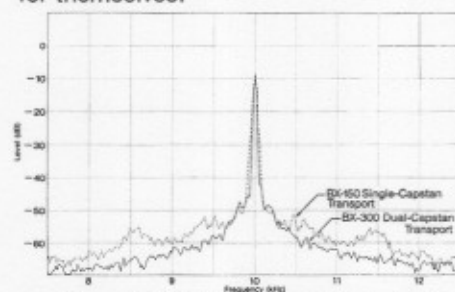
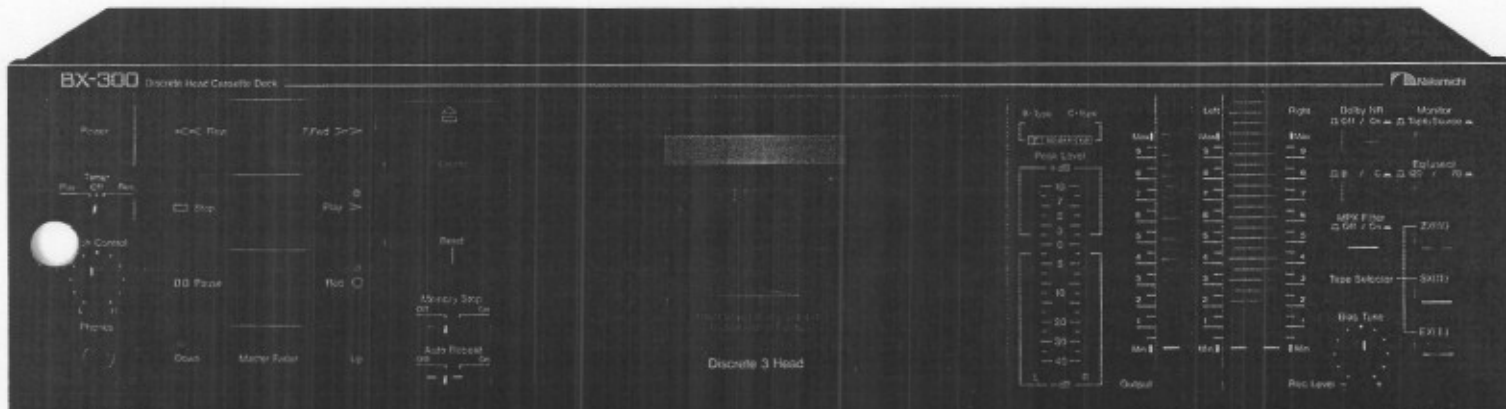


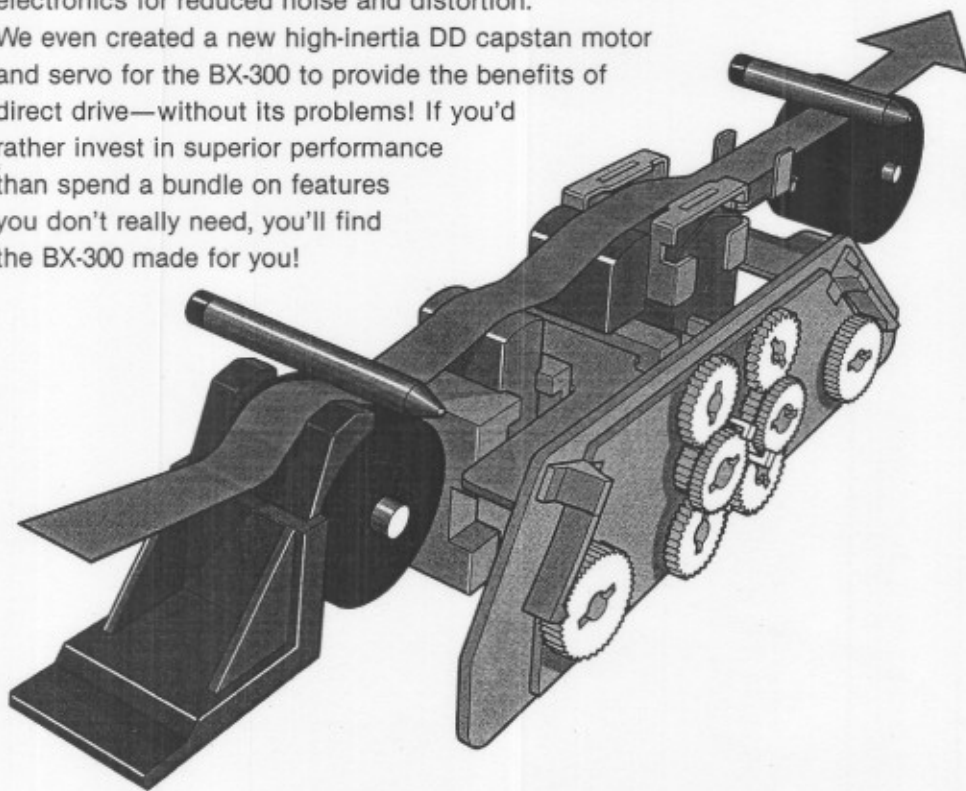
Figure 5 BX-300 Modulation-Noise Analysis
Eq: 70µs/ Freq: 10kHz/ Tape: ZX (Metal)



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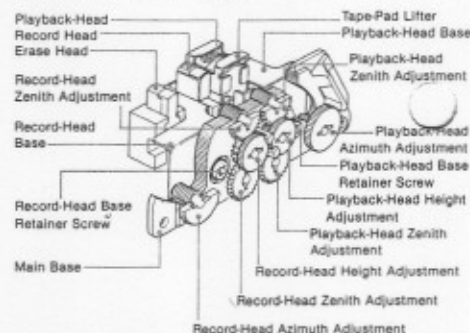


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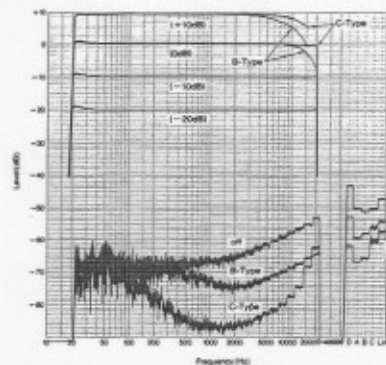


Figure 2 BX-300 Frequency Response/Noise Analysis
Deck: BX-300/ Tape: ZX (Metal)/ PB Eq: 70 μ s/ MPX Filter: off

High-Inertia Direct-Drive Capstan Motor And High-Precision Servo Ensure Ultra-Low Wow & Flutter

"Direct Drive" *should* be superior to belt drive because a belt can introduce speed variations if it doesn't run true. But, direct drive mercilessly reveals motor cogging because there's no compliant belt to filter it. Cogging causes high frequency flutter that is *heard* but *ignored* in specifications. *All DD decks are not the same!*

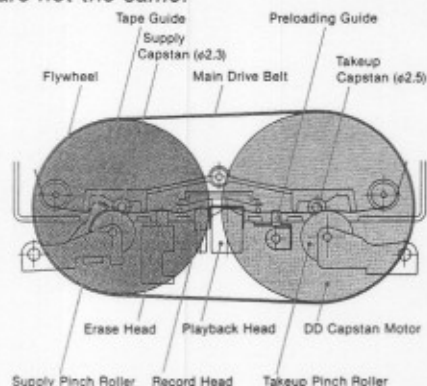
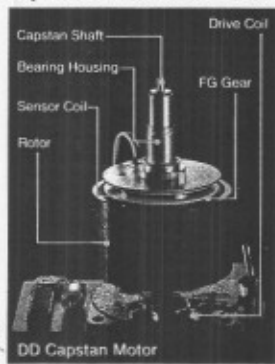


Figure 6 Top View Of Asymmetrical Dual-Capstan System

The BX-300 takeup capstan is directly driven by an outstanding new motor that is virtually cog-free thanks to its unusually high inertia. The motor has an exceptionally heavy rotor with the mass concentrated at the circumference to create a flywheel that ensures smooth rotation. It is brushless, slotless and coreless so torque fluctuations are inherently low.



To further reduce flutter, we extended the servo bandwidth to correct torque variations up to 1 kHz—the key element being a 160-segment frequency generator that senses speed every 2-1/4 degrees of rotation! A careful choice of

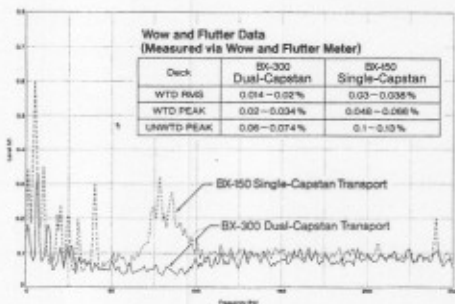


Figure 7 BX-300 Flutter Analysis

Frequency: 3kHz Test Tape/Wow and Flutter Meter: Meguro MK-615/Spectrum Analyzer: HP-3582A

components ensures excellent stability over time and temperature.

Figure 7 shows the results—cog-free performance with under 0.027% wow and flutter!

The BX-300 features Nakamichi's "Silent Mechanism" in which a microprocessor-controlled Motor-Driven Cam replaces conventional solenoids. There's no mechanical shock to upset head alignment and each operation is performed swiftly and precisely.

The motor actuates three switch cams to inform the microprocessor of the current status. This "dialogue" between mechanism and microprocessor permits sophisticated precise control. For example, when PLAY is pressed, the heads approach the tape very rapidly but, just before contact, slow down and ease into place. Only *after* the tape has contacted the heads do the pressure rollers engage. This ensures stable accurate tape tension from the outset.

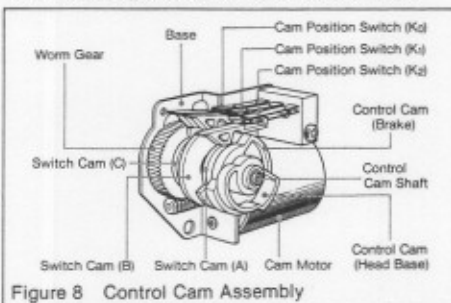
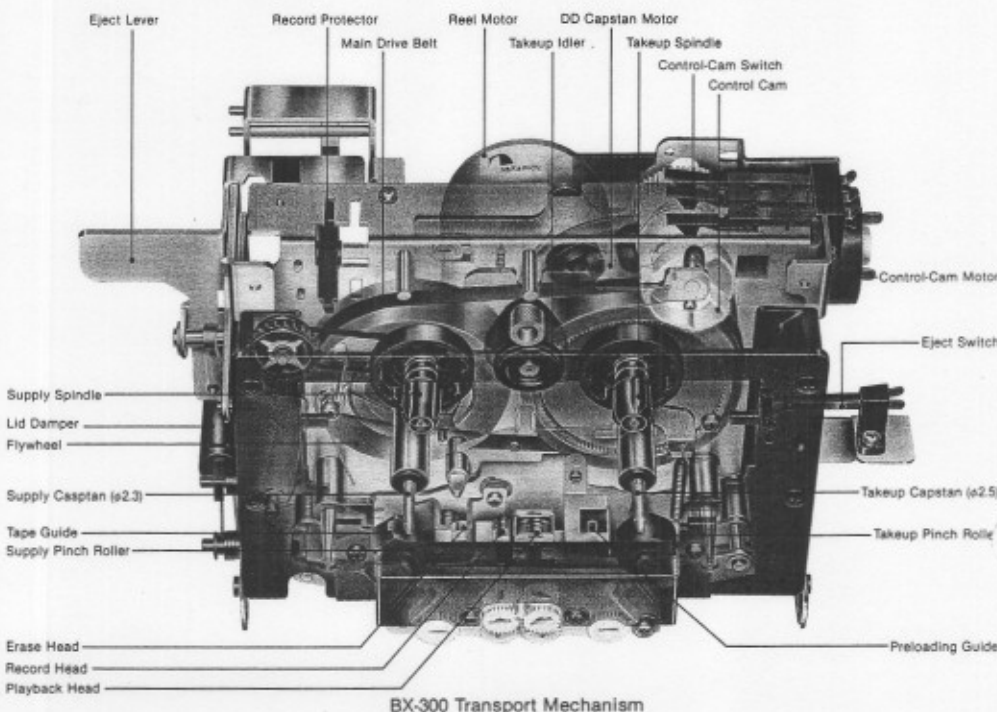


Figure 8 Control Cam Assembly

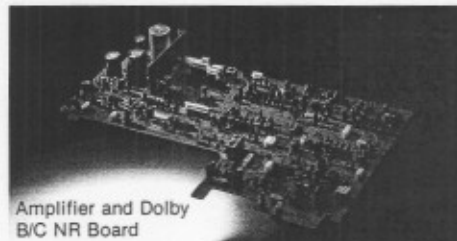


Nakamichi Electronics On A Par With The Finest Preamps

To realize the full potential of Nakamichi heads and use the Dolby NR system to best advantage, we developed new electronics for the BX-300. With distortion under 0.005%, they're equivalent to the finest preamps!

• **Recording, line and headphone amplifiers** are direct-coupled and bipolar-powered for maximum dynamic range. The Double-NF recording equalizer is directly coupled to the recording head for low distortion and precise compensation.

• **Playback amplifiers** are sensitive to power supply fluctuations; our special circuitry overcomes this problem and yields excellent S/N. High-gain low-noise input FETs and Double-NF topology reduce distortion and noise and ensure perfect head matching.



Amplifier and Dolby B/C NR Board

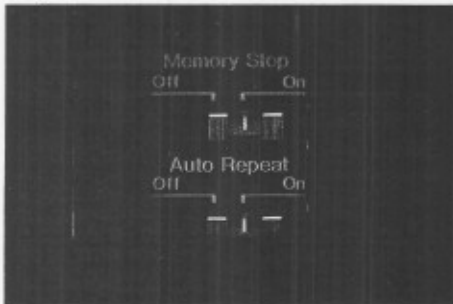
• **A central power supply** feeds each circuit separately to eliminate noise and crosstalk.

• **Dolby chips** are handpicked to ensure perfect matching and realize Dolby-C's full potential.

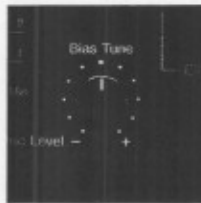
An Array Of Truly Useful Features For Superb Operating Convenience

•**Dual-Speed Master Fader:** Once you've set maximum recording level and channel balance with the BX-300's left and right Rec Level sliders, you can create professional fades at the touch of a button. Press lightly on UP or DOWN for a 4-second fade; press and hold for a 2-second fade.

•**Auto Repeat:** Turn on Auto Repeat and the tape automatically rewinds and replays when it reaches the end. Or, use Auto Repeat with Memory Stop to repeat playback from counter zero.



•**Bias Fine Tuning:** Even tapes of the same general type differ somewhat in bias requirements. The BX-300's Bias Fine Tune control allows you to adjust bias to create perfect recordings.



•**Pitch Control:** It's no problem to "tune" the BX-300 to your piano or other musical instrument. Its Pitch Control allows you to alter playback speed by $\pm 6\%$ —one semitone—to correct an off-pitch recording.



•**Dolby B/C Noise Reduction:** B-type NR reduces noise in the upper frequency region by approximately 10 dB. C-type NR gives you 20 dB noise reduction from 2 kHz to 8 kHz where tape hiss is most audible.

•**Wide-Range Peak-Responding Meters:** LEDs accurately indicate recording level over a wide 50-dB range (-40 dB to $+10$ dB).

•**4-Digit LED Tape Counter:** Referenced to "0000", this precision counter reads bidirectionally from " -999 " to "9999".

•**Memory Stop:** When on, the tape stops at counter zero in fast forward or rewind.

•**Rec Mute:** Creates interprogram blanks at the touch of a button.

•**Defeatable MPX Filter:** Removes the 19-kHz pilot when recording FM broadcasts to prevent Dolby mistracking.

•**Timer Rec/Play:** Permits unattended recording or playback via an external timer.

•**One-Touch Rec Pause:** Press RECORD to enter Rec Standby, then PLAY to initiate recording.

•**Slack Tape Takeup:** Automatic at each loading to prevent tape damage.

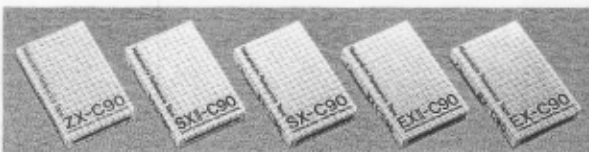
•**Remote Control:** Via optional RM-200.

BX-300 Specifications

Track Configuration	4 tracks/2-channel stereo
Heads	3 (erase head \times 1, record head \times 1, playback head \times 1)
Motors	Transport: FG servo, brushless, slotless, coreless, DD motor (capstan drive) \times 1 DC motor (reel drive) \times 1 Mechanism: DC motor (cam operation) \times 1
Power Source	100, 120, 120/220-240, 220 or 240 V AC; 50/60 Hz (according to country of sale)
Power Consumption	Approx. 27 W
Tape Speed	Recording: 1-7/8 ips (4.8 cm/sec) \pm 0.5% Playback: 1-7/8 ips (4.8 cm/sec) \pm 6% (adjustable)
Wow and Flutter	Less than \pm 0.048% WTD Peak Less than 0.027% WTD RMS
Frequency Response	20 Hz—20,000 Hz \pm 3dB (-20 dB recording level, ZX/SX/EXII tape)
S/N Ratio (A-WTD rms)	Dolby-C NR: Better than 70 dB (re 3% THD at 400 Hz, ZX tape) Dolby-B NR: Better than 64 dB (ZX tape)
Total Harmonic Distortion (400 Hz, 0 dB)	Less than 0.9% (ZX tape) Less than 1.0% (SX, EXII tape)

Erase	Better than 60 dB (100 Hz, 0 dB)
Separation	Better than 36 dB (1 kHz, 0 dB)
Crosstalk	Better than 60 dB (1 kHz, 0 dB)
Bias Frequency	105 kHz
Input (Line)	50 mV, 30 kilohms
Output (Line)	1.0 V (400 Hz, 0 dB, output control max.) 2.2 kilohms
(Headphone)	5 mW (400 Hz, 0 dB, output control max.) 8 ohms
Dimensions	430(W) \times 100(H) \times 250(D) millimeters 16-15/16(W) \times 3-15/16(H) \times 9-7/8(D) inches
Approximate Weight	5.6 kg; 12 lb 6 oz

- Specifications and appearance subject to change for further improvement without notice.
- Noise Reduction System manufactured under license from Dolby Laboratories Licensing Corporation.
- The word "DOLBY" and the Double-D Symbol are trademarks of Dolby Laboratories Licensing Corporation.



Tapes
ZX Metallurgy Cassette Tape (70 μ s, metal bias)
ZX C-60 ZX C-90
SXII Super Ferricobalt Tape (70 μ s, CrO₂ bias)
SXII C-60 SXII C-90
SX Ferricobalt Cassette Tape (70 μ s, CrO₂ bias)
SX C-60 SX C-90
EXII Ferricrystal Cassette Tape (120 μ s, normal bias)
EXII C-60 EXII C-90
EX Ferrioxide Cassette Tape (120 μ s, normal bias)
EX C-60 EX C-90



DM-10 Head Demagnetizer



RM-200 Remote Control



SF-10 Subsonic Filter



SP-7 Stereo Headphones

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Printed in Japan S-8411200B