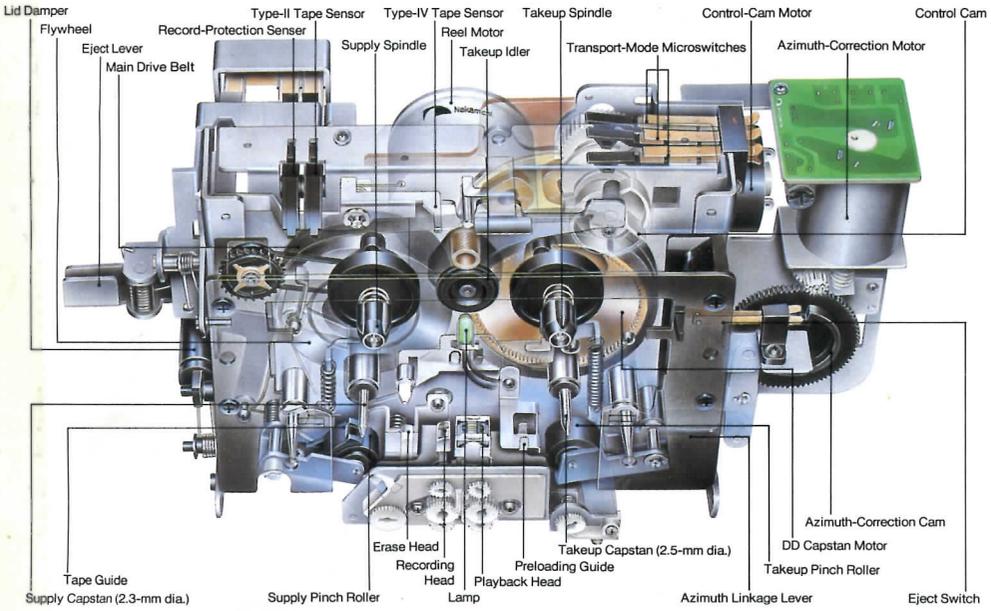


I-Capstan Transport/High-Performance Electronics



Asymmetrical Dual-Capstan Direct-Drive Transport

Dual-capstan transports differ radically but you wouldn't know it from "weighted" wow and flutter specifications which consider change in pitch (wow) more important than the sour sound produced by fast speed variations (flutter). And, "weighted" specifications entirely ignore scrape flutter and modulation noise—two transport-related problems that *dramatically* reduce clarity.

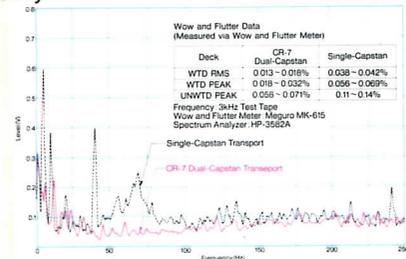


Figure 10 CR-7 Flutter Analysis

Nakamichi believes that pure sound is most important and we've designed the CR-7/CR-5 transport to ensure just that! Unlike conventional dual-capstan transports, the CR-7/CR-5 drive is "asymmetric." Capstans and flywheels have different diameters and rotate at different rates to prevent resonance. As a result, wow is reduced and randomized—not concentrated at specific frequencies where it is audible.

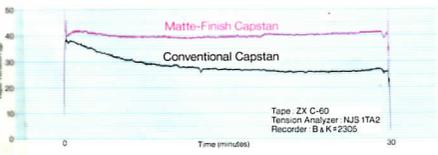


Figure 11 Tape Tension Comparison

Our capstans have a "matte" finish that give them a better grip on the tape.

This, together with a precision reel-drive system, ensures extremely uniform tension—so uniform that the pressure pad isn't needed to maintain tape-to-head contact. A unique "lifter" forces it out of the way. Without the pressure pad to

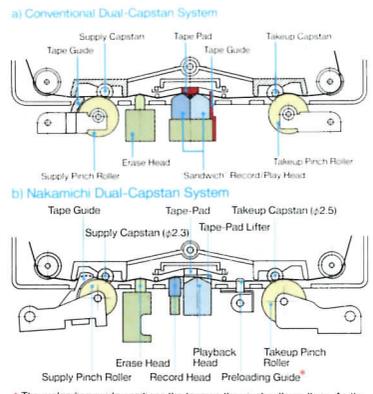
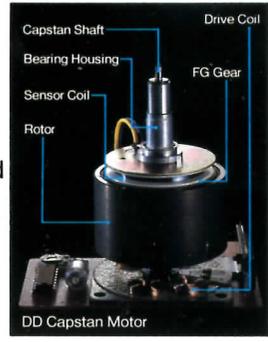


Figure 12 Tape Path in A Dual-Capstan System

cause "skew," the tape tracks with exquisite accuracy so there's no need for a guide between the capstans. Eliminating the pad and guide—an exclusive Nakamichi technology—eliminates the flutter and modulation noise created as the tape scrapes by them and music emerges with the unique clarity called "Nakamichi Sound." The CR-7/CR-5 Direct-Drive capstan motor is specially designed to suppress the "cogging" that plagues conventional DD transports. It's brushless,



slotless and coreless so torque fluctuations are inherently low. More important, its rotor has an exceptionally high moment of inertia to create a flywheel effect. A 160-segment FG sensor determines motor speed every 2-1/4° of rotation and feeds a wide-bandwidth servo that corrects torque variations occurring at a 1-kHz rate!

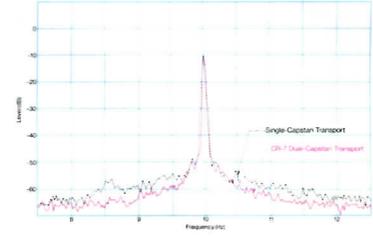


Figure 13 CR-7 Modulation-Noise Analysis
Eq: 70µs/Freq:10kHz/Tape: ZX (Metal)

The Nakamichi "Silent Mechanism" has been proven in tens of thousands of transports. Its microprocessor-controlled motor engages heads and brakes more smoothly and precisely than a solenoid. There's no shock or vibration for the motor turns only to *change* functions. Cam operation permits the heads to approach the tape rapidly then slow down and ease into place to preserve alignment. Only *after* contact, do the pressure rollers engage thus ensuring stable tape tension from the outset. The transport senses the presence of slack tape as soon as a cassette is mounted and instantly takes up the slack to protect the tape.

High-Performance Electronics

CR-7/CR-5 electronics are on a par with the finest preamps. Distortion is a mere 0.005%! Record, line and headphone amplifiers are direct coupled to minimize distortion and bipolar powered to maximize dynamic range. The playback preamp uses special FETs in a discrete non-differential configuration that has 3-dB less noise than a differential topology. Leakage current is so low that the play head can be directly coupled to the preamp for minimum noise and distortion. A multi-tap supply provides



independent regulated power to each circuit thus preventing interference between them. Internal shields are strategically placed to prevent noise pickup and Dolby ICs are hand matched to ensure that tracking error is less than 1/4 dB.