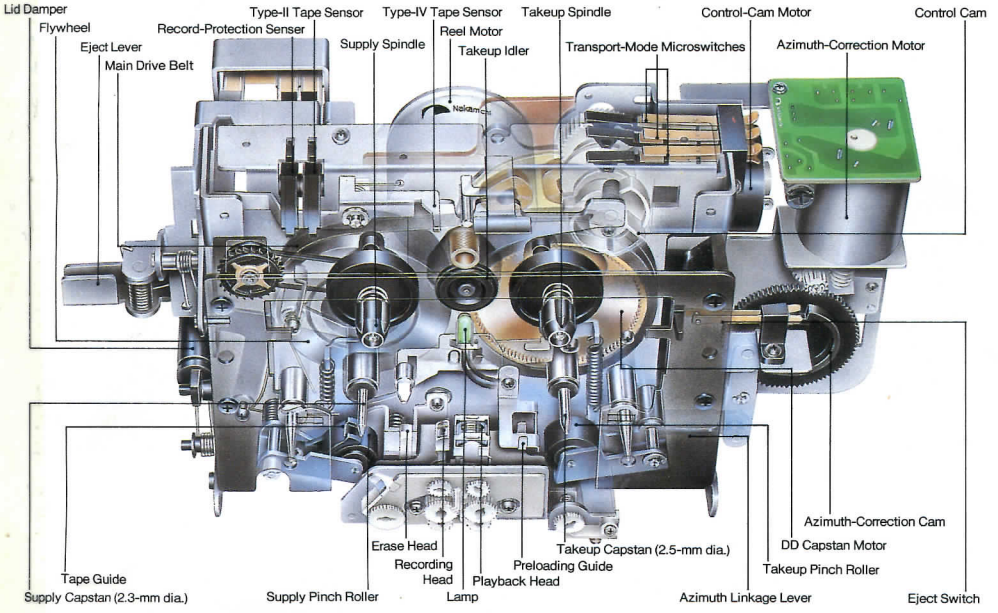
Nakamichi
CR-7/CR-5
Discrete Head Cassette Decks

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.

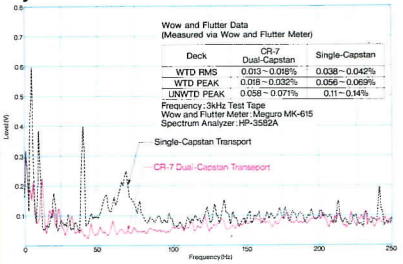


Figure 10 CR-7 Flutter Analysis

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.

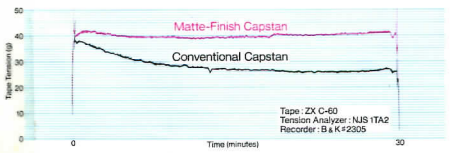


Figure 11 Tape Tension Comparison

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

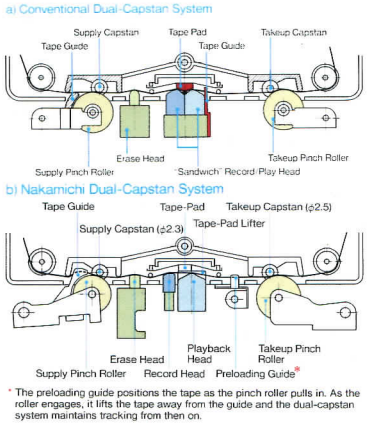
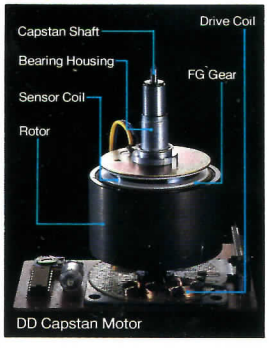


Figure 12 Tape Path In A Dual-Capstan System

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!

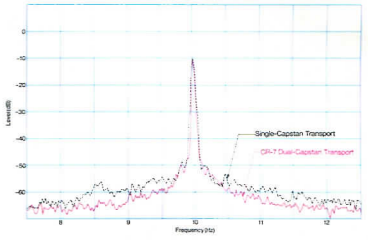
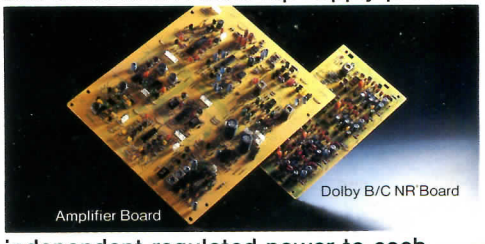


Figure 13 CR-7 Modulation-Noise Analysis
Eq: 70μs/Freq: 10kHz/Tape: ZX (Metal)

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.

A Wide Range Of Features Make The CR-7/CR-5 Exceptionally Easy To Use

Real-Time Counter (CR-7) 4-Digit Tape Counter With Memory Stop & Auto Repeat (CR-7/CR-5)

The CR-7 real-time counter uses a new microprocessor that operates quite differently from a stopwatch. It indicates elapsed or remaining time, anywhere in the tape pack, *even if you haven't begun counting from the start of tape* and it maintains time during fast winding.

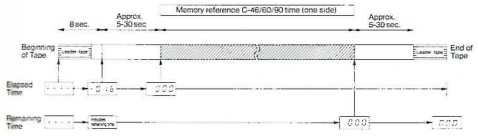


Figure 14 Real-Time Counter Operation

There's no need to wind to the end to "calibrate" the counter. Press TAPE LENGTH until the proper legend (C-46, C-60 or C-90) appears and, when a tape is mounted and run for 8 seconds, the system will indicate either elapsed or remaining time. You choose which by pressing COUNTER MODE to change the display from a conventional tape counter, to the elapsed-time mode, to the remaining-time mode and back. In both time modes, the word "Time" and minute/second indicators appear; in the remaining-time mode, "Remaining" also appears.

4-Digit Tape Counter Mode | Elapsed-Time Mode | Remaining-Time Mode

CR-7 Tape Counter Display

The CR-7/CR-5 4-digit tape counter produces a reading more proportional to the length of tape than is the case with ordinary tape counters. In these decks, the angular speeds of *both* the takeup *and* the supply hubs are measured and fed to a microprocessor that computes the length of tape that has passed.

Both decks feature Memory Stop and Auto Repeat. With Auto Repeat, the decks rewind the tape at the end (in either RECORD or PLAY) and reinitiate playback. Memory Stop causes the tape to stop at counter "0000" during FAST FORWARD and REWIND.

Auto Fade (CR-7)

The Nakamichi Auto Fade system featured on the CR-7 eliminates abrupt breaks in the program by automatically fading out the recording shortly before the tape runs out. Pressing AUTO FADE activates the system. Although Auto Fade monitors remaining time via the CR-7's real-time counter, it functions correctly no matter which counter mode you've chosen.

Auto/Manual Tape/EQ Selection

The CR-7 and CR-5 automatically sense tape type via the keyways molded into modern Type-I, -II, and -IV cassette housings and set standard bias and equalization accordingly. However, unlike other "auto-setting" decks, the CR-7 and CR-5 give you a *choice.*

Pressing MANUAL TAPE EQ, overrides the automatic system so you can choose bias and equalization for yourself. Not only does this permit you to use older cassettes that lack keyways, it gives you the opportunity to use 120-μs (Type-I) equalization with a Type-II or -IV tape (to increase high-frequency headroom) or 70-μs equalization with a Type-I tape (to reduce background noise). In either case, the tape and EQ settings in actual use are indicated in the Central Panel. You have the best of both worlds: the convenience of automatic setting, the flexibility of optimizing equalization for special recording situations!

If automatic tape selection is in use, the CR-7 uses the data accumulated by its Auto Calibration system and stored in its memory bank for that tape type; the CR-5 uses standard values modified by the setting of its Bias Tune control.

Bias Tune (CR-5)

Although the CR-5 does not have the CR-7's Auto-Calibration system, it does give you a convenient means of adjusting bias to optimize recordings via its front-panel BIAS TUNE control. Since the CR-5 features off-tape monitoring, you can adjust bias quite accurately by comparing the sound quality of the recording while switching between SOURCE and TAPE. Figure 15 depicts the response range that can be achieved with SX tape.

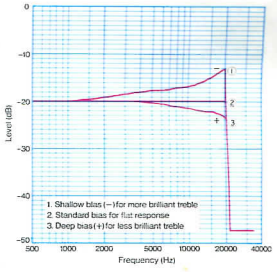


Figure 15 Frequency Response With Bias Fine Tuning
Deck: CR-5/Level: −20dB Eq: 70μs/Tape: SX

FL Central Display

The CR-7/CR-5 FL Central Display keeps you advised of every important setting. Of course, there are wide-range (50-dB) peak-responding level meters—with a 2-second "peak-hold" on the CR-7. The CR-7 meter also converts to a "relative azimuth" indicator whenever you're adjusting azimuth. AZIMUTH/LEVEL/BIAS/READY legends monitor progress during Auto Calibration and blink if Auto Calibration cannot be achieved.

Both displays indicate the MONITOR (Source/Tape), DOLBY (B/C or nothing), TAPE (EX/SX/ZX) and EQUALIZATION (120/70) settings. And both decks show the "MPX Filter" legend when the multiplex filter is engaged. The CR-7 also indicates when its "Subsonic Filter" is active, when "Auto Fade" is on and when the level meters are in the "Peak Hold" mode.

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CR-5

Discrete Head Cassette Deck

CR-7/CR-5 Feature-Comparison Chart

FEATURE	CR-7	CR-5
Auto Calibration Adjusts azimuth, level and bias for optimum recording	●	
Playback Head Azimuth Fine Tuning Control Ensures full-range reproduction of any tape	●	
Discrete Three-Head Technology For maximum dynamic range and most extended response	●	●
Asymmetrical Dual-Capstan Diffused-Resonance Transport Prevents common-mode resonance and maintains constant tension	●	●
Brushless/Slotless/Coreless DD Capstan Motor & FG Servo Reduce wow and flutter to 0.027% (WTD RMS)	●	●
Pressure-Pad Lifter Reduces scrape flutter and modulation noise	●	●
Automatic Slack-Tape Takeup Protects precious tapes	●	●
Auto/Manual Tape & Equalization Selection Auto setting for convenience; manual for special situations	●	●
Real-Time Tape Counter Displays elapsed or remaining time	●	
Auto Fade Fades out recording before end to avoid abrupt transitions	●	
4-Digit Electronic Tape Counter Indicates relative position on the tape	●	●
Memory Stop Stops tape at counter "0000" in fast forward or rewind	●	●
Auto Repeat Rewinds tape at end of side and reinitiates playback	●	●
Dual-Speed Master Fader One-touch fade-out/fade-in over 4 or 2 seconds	●	●
Bias Fine Tuning Helps obtain best bias match to the tape		●
Low-Noise/Low-Distortion Direct-Coupled Electronics For maximum dynamic range and minimum distortion	●	●
Dolby B/C Noise Reduction Reduces tape hiss by 10 to 20 dB	●	●
FL Central Display Accurate 50-dB peak-level meters with 2-second peak hold (CR-7 only) plus Tape/EQ/Dolby/Filter/Monitor indicators	●	●
One-Touch Rec/Pause Press RECORD to enter Rec Standby, then PLAY to record	●	●
Rec Mute Mutes recording for as long as button is pressed	●	●
MPX Filter Prevents Dolby mistracking when recording FM-Stereo	●	●
Subsonic Filter Prevents tape overload when recording warped discs	●	
Timer Rec/Play Unattended recording or playback via accessory timer	●	●
Wireless Remote Control Permits remote control of transport, REC/PLAY and azimuth	●	
Wired Remote Control Optional RM-200 for remote control of transport and REC/PLAY		●
System Remote Control Remote operation via the CA-7 System Remote Control	●	●
Individual Left, Right & Master Level Controls Establish channel balance and permit manual fades	●	●
Output Level Control & Headphone Jack Matches level to other sources; permits private listening	●	●

CR-7/CR-5 Specifications

Main Unit

Track Configuration	4-track/2-channel stereo
Heads	3 (erase head × 1, record head × 1, playback head × 1)
Motors	**Tape Transport** FG-servo, brushless, slotless, coreless DD motor (capstan drive) × 1 DC motor (reel drive) × 1 **Mechanism** DC motor (cam drive) × 1 DC motor (azimuth control) × 1 (CR-7 only)
Power Source	100, 120, 120/220—240, 220 or 240 V AC; 50/60 Hz (according to country of sale)
Power Consumption	**CR-7:** 55 W max. **CR-5:** 45 W max.
Tape Speed	1-7/8 ips (4.8 cm/s) ±0.5%
Wow and Flutter	Less than ±0.048% WTD Peak Less than 0.027% WTD rms
Frequency Response (ZX, SX, EXII tape) (−20 dB recording level)	**CR-7:** 20—20,000 Hz ±2 dB 18—21,000 Hz ±3 dB **CR-5:** 20—20,000 Hz ±3 dB
S/N Ratio (A-WTD rms) (re 3% THD at 400 Hz, ZX tape)	**Dolby-C NR:** Better than 72 dB **Dolby-B NR:** Better than 66 dB
Total Harmonic Distortion (400 Hz, 0 dB)	Less than 0.8% (ZX tape) Less than 1.0% (SX, EXII tape)
Erasure	Better than 60 dB (100 Hz, + 10 dB)
Separation	Better than 37 dB (1 kHz, 0 dB)
Crosstalk	Better than 60 dB (1 kHz, 0 dB)
Bias Frequency	105 kHz
Input (Line)	50 mV/40k ohms
Output (Line)	1.0 V (400 Hz, 0 dB, Output Level at max.) 2.2k ohms
(Headphone)	12 mW into 8 ohms (400 Hz, 0 dB, Output Level at max.)
Fast-Wind Time	Approx. 80 seconds (C-60 cassette)
Dimensions	435(W) × 135(H) × 306(D) millimeters 17-1/8(W) × 5-5/16(H) × 12(D) inches
Approximate Weight	**CR-7:** 9.0 kg; 19 lb 13 oz **CR-5:** 8.5 kg; 18 lb 12 oz

RM-7C Remote Control Unit (Supplied with CR-7)

System	Infrared pulse system
Power Supply	DC 3 V (1.5 V × 2)
Dimensions	57(W) × 19(H) × 175(D) millimeters 2-1/4(W) × 3/4(H) × 6-7/8(D) inches
Approximate Weight	140 g; 5 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.

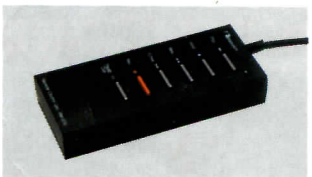
Tapes

ZX Metalloy Cassette Tape (70 μs, metal bias) ZX C-60 ZX C-90

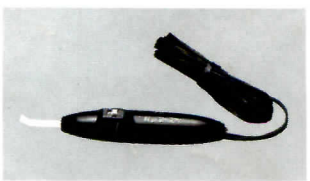
SX Ferricobalt Cassette Tape (70 μs, CrO_2, bias) SX C-60 SX C-90

SX II Super Ferricobalt Tape (70 μs, CrO_2, bias) SX II C-60 SX II C-90

EX II Ferricrystal Cassette Tape (120 μs, normal bias) EX II C-60 EX II C-90



RM-200 Remote Control



DM-10 Head Demagnetizer

SP-7 Stereo Headphones

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