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Nakamichi

RX-202

Unidirectional
Auto Reverse Cassette Deck

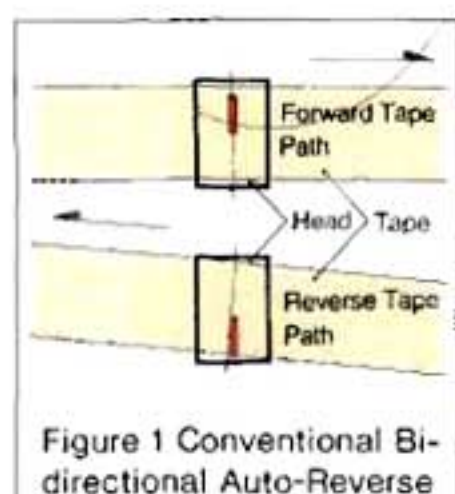


The RX-202 With UDAR Auto Reverse Convenience... Unidirectional Performance!

What's wrong with ordinary auto reverse?

Nothing would be wrong with conventional auto reverse *if* cassettes were perfect. Unfortunately, they're not! Tape can't be slit to perfectly uniform width. Housings can't be molded to zero tolerance. And, tolerances can't be ignored!

In-cassette guides must be broad enough to accommodate the widest tape. Most of the time, the tape is narrower and is guided by one edge. It's impossible to guarantee that the pins on which the guides rotate are perfectly perpendicular to the direction of motion. The tape edge in contact with the roller then forces the guide up or down the pin.



As long as the tape moves in one direction, equilibrium is established. The tape carries the guide to one side and it stays there. But when direction is reversed, the tape

is likely to carry the guide to the *opposite* side of the pin and track differently.

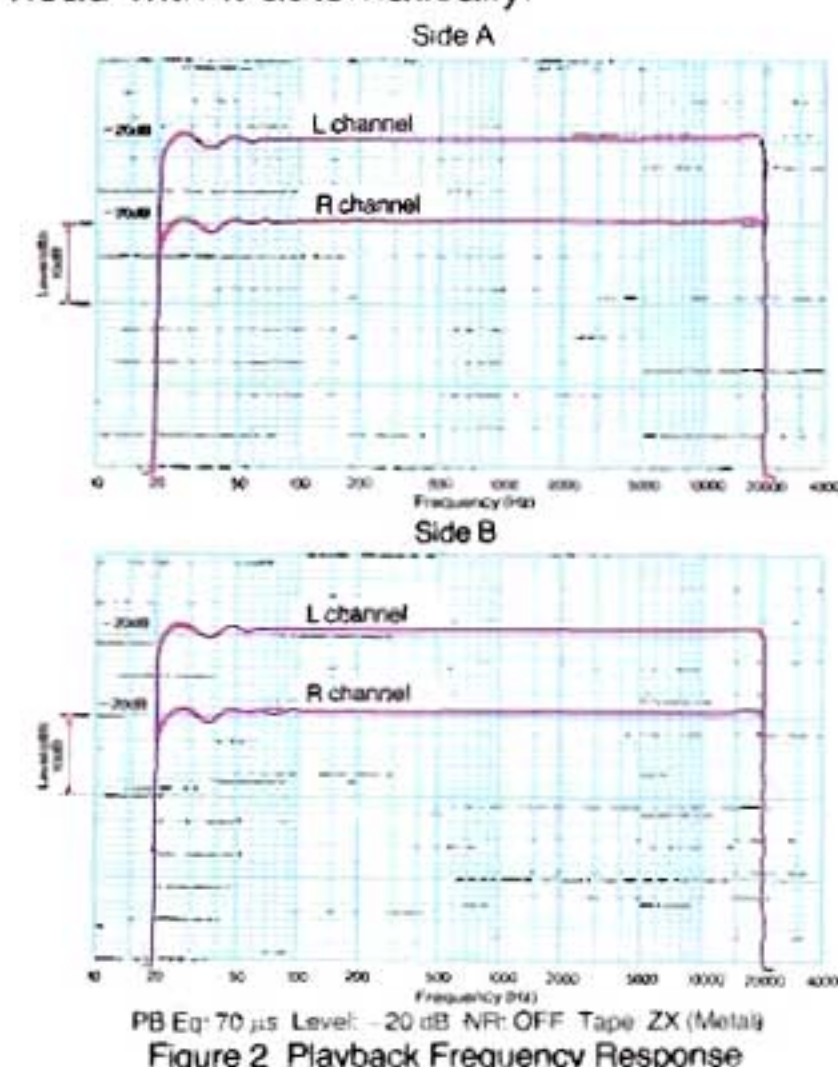
That's the "bidirectional azimuth problem" in a nutshell. Conventional auto-reverse decks change *tape* direction going from Side A to Side B. On Side A, tape moves from left to right; on Side B, it moves from right to left. If the tape was recorded moving from left to right—the normal case—there probably will be azimuth error when it's played from right to left.

Even a tiny error has considerable effect on high-frequency response. An error of 2/15 of a degree causes a 3-dB loss at 10kHz and eliminates 20-kHz information entirely, and noise-reduction systems compound the problem.

The RX-202... Unconventional Auto Reverse!

Nakamichi always has been keenly aware of the "bidirectional azimuth problem" and, for years, offered only *unidirectional* cassette recorders for we could not sacrifice performance for convenience!

NAAC—Nakamichi Auto Azimuth Correction used in the DRAGON and TD-1200 Mobile Tuner/Cassette Deck—eliminates azimuth error entirely by *tracking* recorded azimuth and aligning the playback head with it automatically.



UDAR—*Unidirectional Auto Reverse*—featured in the RX-202 *avoids* bidirectional azimuth error altogether!

Unidirectional Auto Reverse... Convenience Without Compromise!

UDAR offers the convenience of conventional auto-reverse and the performance for which Nakamichi is famous. The concept is so simple that it's elegant.

UDAR *automates* the actions *you* perform when the tape runs out. At the end of a side, UDAR disengages the cassette, turns it around, reloads it, and resumes operation. Simple! Reliable! Effective! And *fast*! UDAR flips the cassette and is back in operation in just over a second!

The RX-202 transport is *Unidirectional*. Tape *always* moves in the *same* way in which it was recorded so there is *no* "bidirectional azimuth error." Response is as perfect on Side B as on Side A—flat from 20 Hz to 20 kHz! And, with unidirectional motion, fast forward always moves the tape towards the *end* of the side, reverse towards the *beginning* so you're never confused as with some bidirectional decks.

UDAR performs every normal auto-reverse operation: "one-way," "once-through," or "continuous" playback and "one-way" or "once-through" recording. Sides change automatically when the tape runs out or whenever you press REVERSE. UDAR is independent of the transport and so does not affect mechanical precision in any way. It's operated by its own motor and controlled by a microprocessor that prevents mistakes.

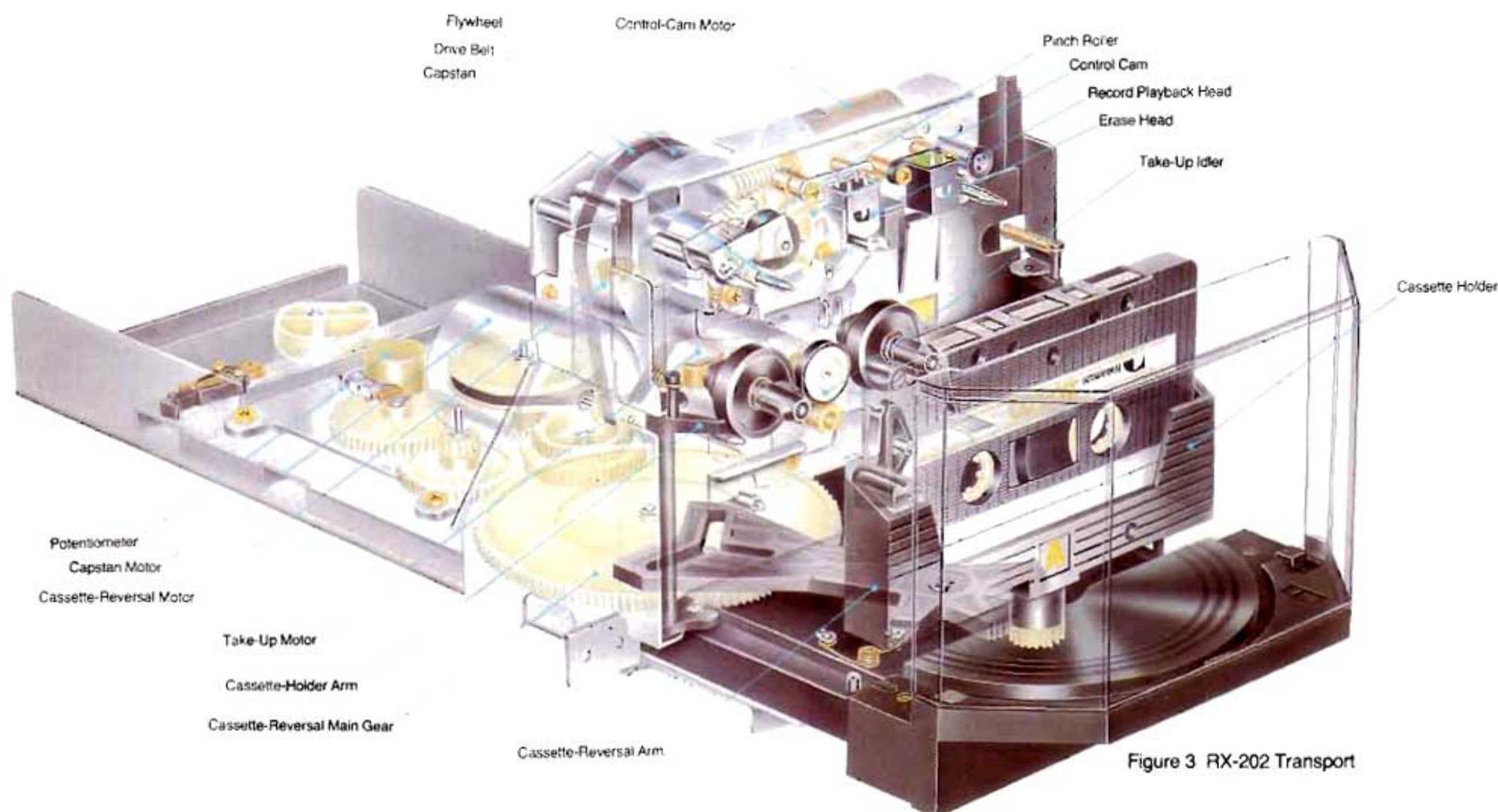


Figure 3 RX-202 Transport

A New Era In Auto-Reverse Operation With Features To Match

Direct Operation and Program Monitor

UDAR's microprocessor is very "smart." It operates the transport itself which makes possible some unusual features—like "Direct Operation" and "Program Monitoring."

To play a cassette, just drop it in and press PLAY. UDAR loads the cassette, closes the door, and the RX-202 enters the playback mode. Any mode can be entered directly merely by inserting a cassette and touching one button!

During playback, UDAR monitors the tape and, when it finds the end of the program (indicated by a 40-second blank), fast forwards to the end of the side and flips the cassette so there's no long wait for a blank "tail" to play through.

Recording has never been easier!

The RX-202 records *both* sides of the tape using the *same* record and erase heads to ensure *identical* performance on Side B and on Side A.

Nakamichi's "Auto Rec Standby" feature makes recording simpler than ever. Say you've started to record a disc and miss the



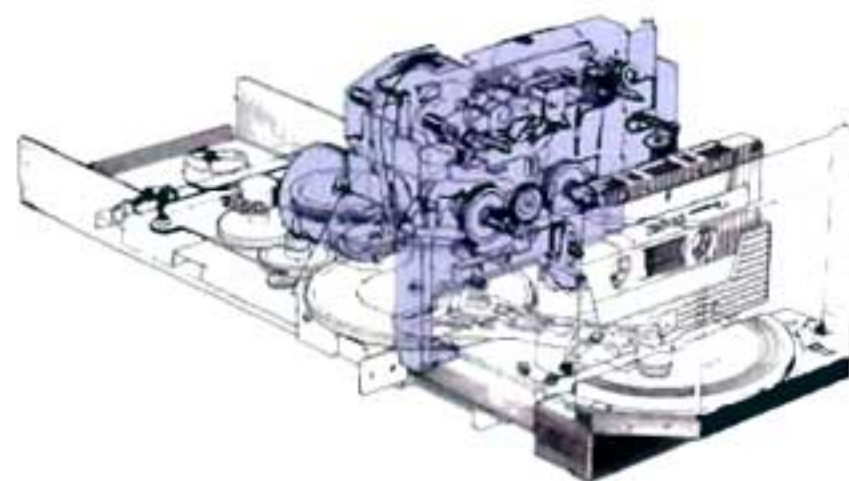
beginning. One touch of the button rewinds the tape, fast forwards through the leader, records a 6-second blank header, resets the tape counter and leaves the RX-202 in the record-standby mode ready to try again. If you're approaching the end of Side A and wish to start the next selection on Side B, press Auto Rec Standby twice in succession. The RX-202 fast forwards to the end of Side A, flips the cassette, skips through the leader, records a blank header, resets the counter, and is ready to record the next selection!

Recording level is set by independent left- and right-channel sliders and monitored by two fast-acting peak-responding LED indicators that span a 37-dB range (from -30 dB to +7 dB).



You can create professional fades in recording level very easily with the Nakamichi Dual-Speed Master Fader. One tap on UP or DOWN creates a smooth 4-second sweep to or from the maximum levels you've set on the sliders. If you press and hold either button, the fade occurs in 2 seconds. Used in tandem, the Master Fader and Auto Rec Standby controls help create tapes with minimum interruption between two sides. You can fade out Side A and fade in Side B without resetting recording level and without reentering the recording mode.

High-performance single-capstan transport



Reel torque and chassis vibration affect tape motion and produce flutter that is not revealed by specifications. Weighted measurements ignore high-frequency flutter although it destroys clarity. Eliminating it is the key to achieving "Nakamichi Sound!"

The RX-202 is powered by four motors: one for UDAR, another to drive the reels, a third for the capstan, and a fourth to operate the unique Nakamichi Motor-Driven-Cam control system. By maintaining functional independence, speed stability is improved and flutter minimized.

In a single-capstan transport, reel-torque variations enter the tape path. The RX-202 uses a reel-drive motor specially developed to produce uniform torque. A precision metal pulley (instead of plastic wheel) transmits the torque, and the RX-202 actually produces less wow than many dual-capstan decks!

The unique Nakamichi Motor-Driven-Cam control system eliminates solenoid vibration, generates less heat, and is much more gentle. The cam brings the heads up to the



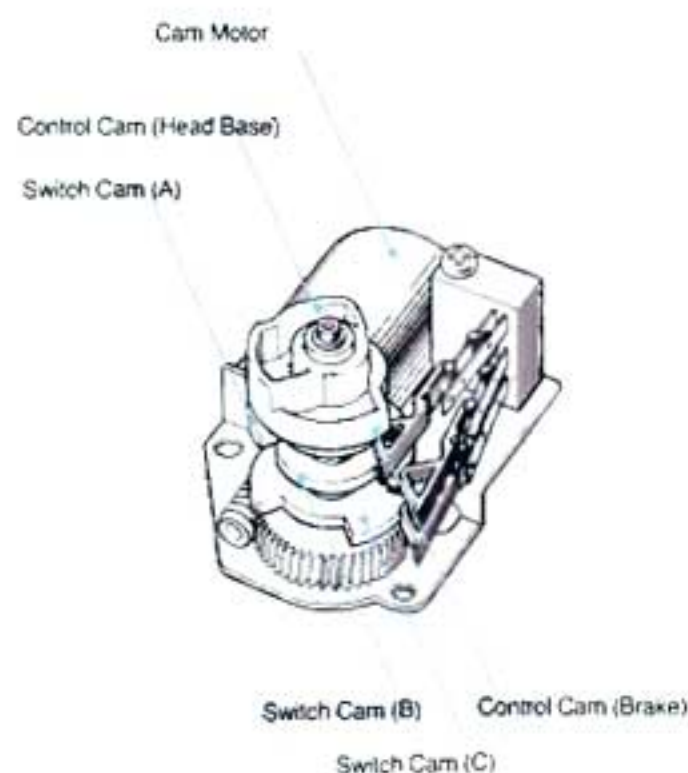


Figure 4 Motor-Driven-Cam Assembly Diagram

tape very rapidly but, just before contact, slows down and eases into position to preserve head alignment. The Motor-Driven Cam is supervised by a microprocessor that scans the keyboard, monitors cam position, and inserts the necessary steps so you can go directly between modes without tape damage.

2-head performance that rivals most 3-head decks!

Using a single head for recording and playback presents significant problems. The gap must be wide enough for recording, yet narrow enough to resolve extremely short wavelengths in playback. The core must have sufficient flux-handling ability to record metal tape, yet sufficient permeability to serve as a sensitive playback device.

These conflicting requirements are exquisitely balanced in the RP-2D R/P head

whose response rivals that of many 3-head systems! Its high-permeability laminated-sendust core provides almost 7 dB headroom on metal tape yet its 1.2-micron gap permits uniform response to 20 kHz on playback. And, low-frequency response is virtually free of "head bumps" thanks to Nakamichi's special hyperbolic contour.

The E-2D erase head's double-gap construction and low-loss ferrite core allow operation at very high frequency and drive level without overheating and so ensure complete erasure of high-coercivity, high-remanence metal tape.

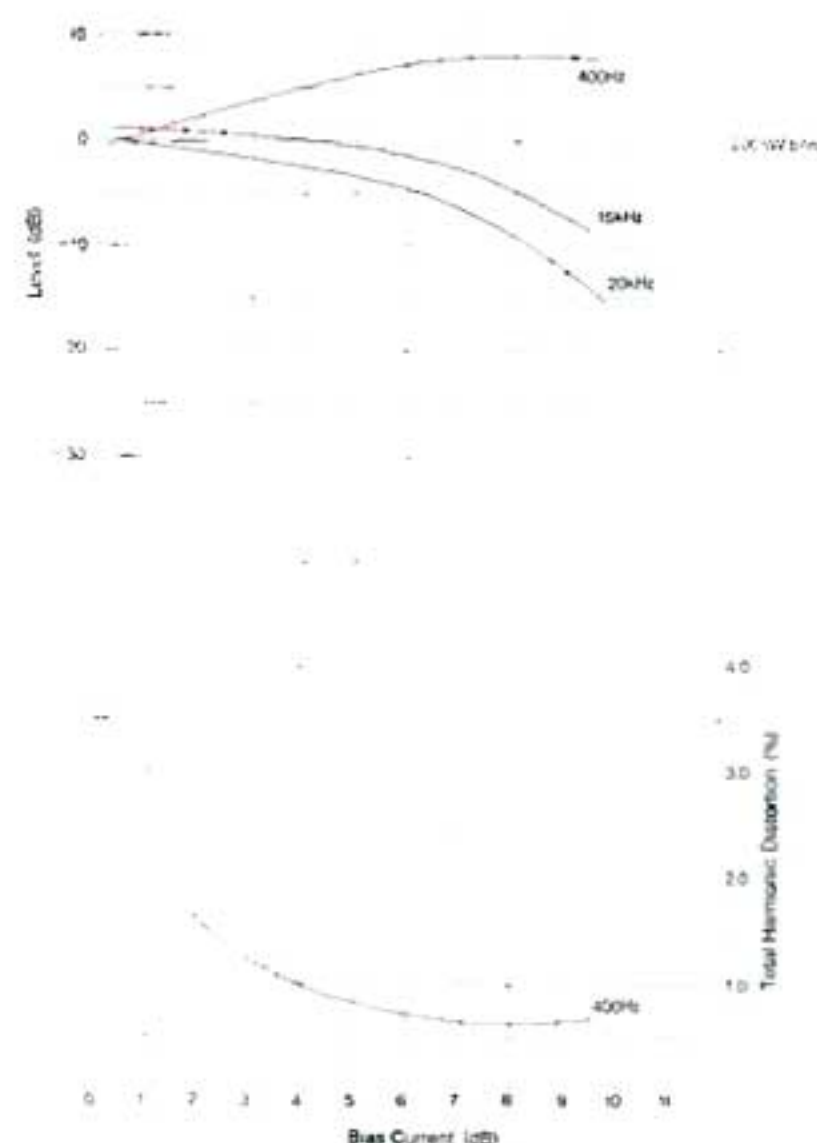


Figure 6 RP-2D Record/Play Head MOL/THD vs. Bias Current
Tape ZX
Bias Freq. 105 kHz

	Control Cam Shift	Cam Position Switch (K2)	Cam Position Switch (K1)	Cam Position Switch (K0)	K ₂	K ₁	K ₀
FF/REW		OFF	OFF	ON	1	1	1
STOP		OFF	ON	ON	1	0	0
PAUSE		ON	ON	OFF	0	0	1
REC/PLAY		ON	OFF	ON	0	1	0
					0	1	1

Figure 5 Cam Positions And Codes

Nakamichi high-performance electronics

A cassette deck's record and playback amplifiers are just as important as its heads and transport. The RX-202 record circuits use high-performance low-noise operational amplifiers of extremely wide dynamic range. Nakamichi's renowned "Double-NF" topology reduces distortion and ensures accurate equalization.

The playback preamp also uses Double-NF equalization but is discretely configured from low-noise transistors that are perfectly matched to the playback head to ensure highest reproduction quality.

The bias oscillator operates at an extremely high frequency to prevent program intermodulation. Special care was taken to eliminate even-harmonic distortion and to provide superior level stability.

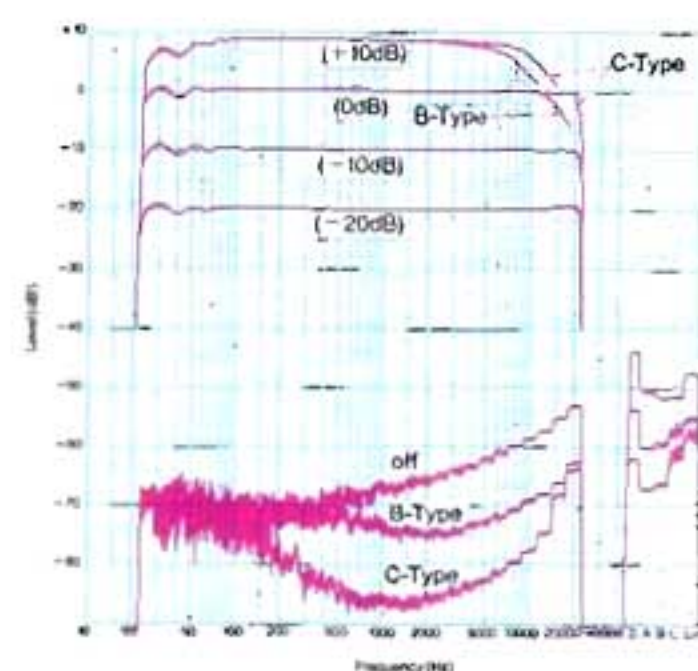


Figure 7 RX-202 Frequency Response/Noise Analysis

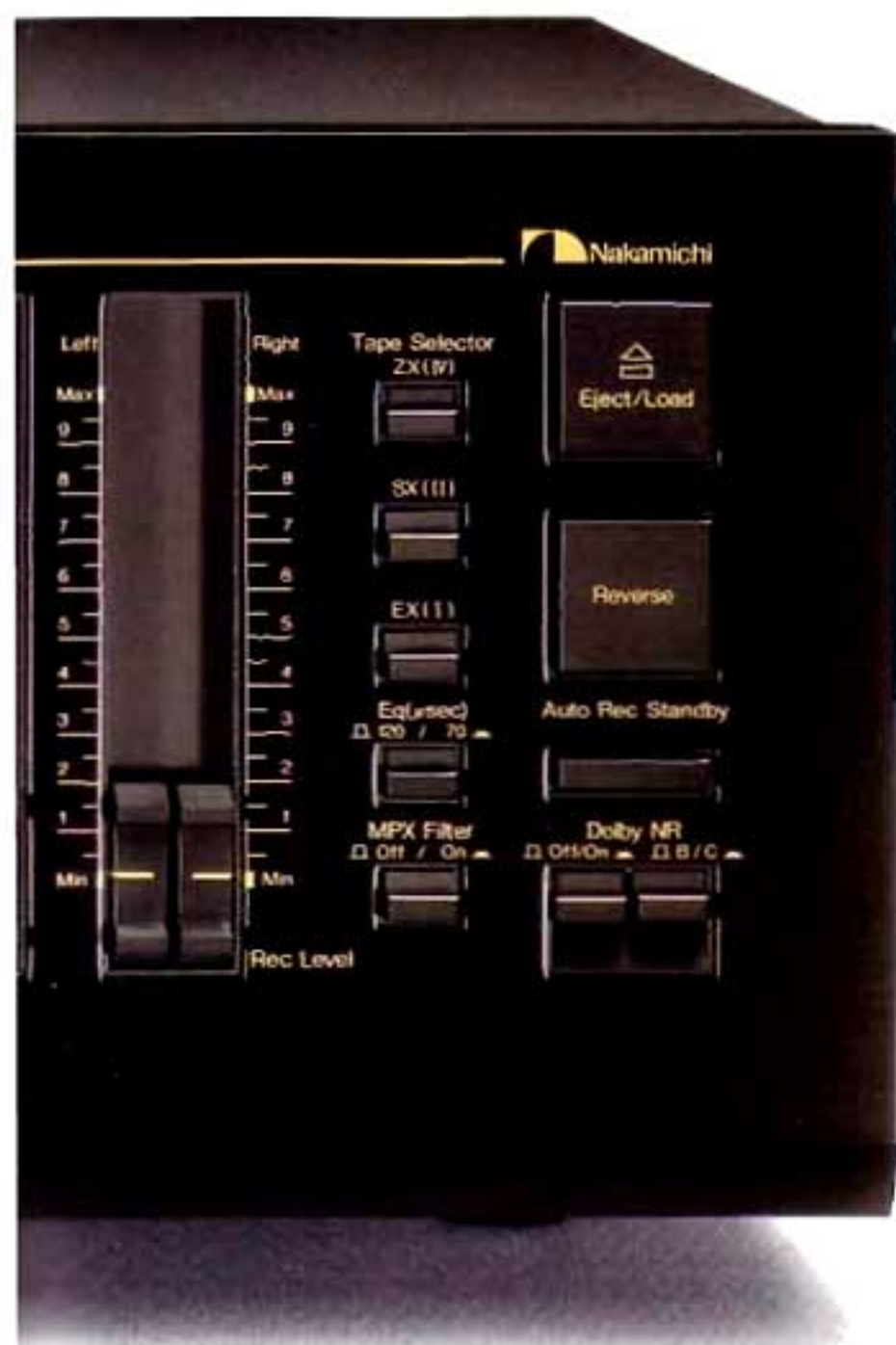
Tape Deck RX-202
Tape ZX (Metal)
PB Eq. 70 μ s

Painstaking adjustments ensure that your RX-202 meets specifications

Tolerances are inherent in every device much as we strive to minimize them. When tolerances are allowed to accumulate, performance varies from deck to deck even though "average production" may be fine.

Internal controls are expensive, but without numerous internal adjustments it is impossible to calibrate a deck and prevent tolerance accumulation. And, unless individual internal adjustments are provided, it is impossible to recalibrate the deck for new tapes.

To achieve our goal of "zero-tolerance production," each RX-202 has numerous internal controls. Every deck is hand tested and calibrated before it leaves the factory. Bias and recording level are set independently for each track and for each major tape type—Normal, Chrome, and Metal. In all, more than 30 individual adjustments were made to your RX-202 before it left the factory!



Unidirectional Auto Reverse A Revolutionary Auto-Reverse System!



There's no denying that auto-reverse operation is convenient. There's no denying that it's desirable. But there's also no denying that conventional auto-reverse decks do not perform as well on Side B as on Side A.

Conventional auto-reverse decks are *bidirectional*, that is, the tape changes direction at the end of each side. On Side A, tape travels from left to right; on side B it moves from right to left. This creates a number of technical problems, the most important being "bidirectional azimuth error."

"Bidirectional azimuth error," like any azimuth misalignment causes a loss of high-frequency response. Noise reduction systems compound the error. The result is dull lifeless sound. Nakamichi was the first to solve the bidirectional azimuth problem by creating NAAC—the Nakamichi Auto Azimuth Correction system found in DRAGON and in the Nakamichi Mobile Sound System. NAAC actually tracks the azimuth of the *recording* but doing so requires exotic and expensive technology.

Now Nakamichi introduces a revolutionary new auto-reverse system that eliminates "bidirectional azimuth error" by *avoiding* it altogether. UDAR—the Nakamichi *Unidirectional* Auto Reverse mechanism—flips the cassette at the end of each side just as you do by hand on a conventional deck. And UDAR is fast! In just over a second, UDAR disengages the cassette from the transport, turns it end for end, reloads it, and resumes normal operation!

UDAR is independent of the transport so it does not affect mechanical operation in any way. And, since tape moves in the *same* direction on *both* sides, there's no bidirectional azimuth error. Response is as perfect on Side B as on Side A!

UDAR provides *auto-reverse* convenience and *unidirectional* performance—a combination unachievable with any other system save NAAC! And, UDAR offers a number of features of its own—like Direct Operation and Single-Head Bidirectional Recording. UDAR—the revolutionary auto-reverse system—only from Nakamichi!



RX-202 FEATURES

- * Unique Nakamichi Uni-Directional Auto-Reverse (UDAR) Mechanism Eliminates The Azimuth-Error Loss Of Conventional Auto-Reverse Decks
- * Auto Rec Standby Automatically Rewinds The Tape, Skips Over The Leader, Records A 6-Second Blank Header, And Activates The Record Standby Mode. Pressed Twice During Recording, Auto Rec Standby Instantly Advances The Tape To The End, Switches To Side B, Skips The Leader, Records A Blank Header, And Enters Record Standby
- * Music-Sensing Circuit Monitors Playback And Fast-Forwards Through Blank "Tail" To Provide Uninterrupted Playback
- * Direct Operation Automatically Loads And Initiates The Desired Function
- * Dual-Speed Master Fader Creates Smooth 4- Or 2-Second Fades At A Touch
- * Microprocessor-Controlled Silent Tape Transport Ensures Smooth Operation And Minimum Flutter
- * Frequency Response Rivals That Of Most Three-Head Decks Thanks To A Specially Designed Laminated-Sendust Record/Play Head
- * Precision Manufacturing And Quality Control With More Than 30 Individual Adjustments On Each Deck
- * Dolby B- And C-Type Noise Reduction With Defeatable MPX Filter
- Independent Tape And Equalization Switches To Accommodate All Tape Types
- Independent Record Level Sliders With Rec Mute And One-Touch Record/Pause
- Precision -30 to +7 dB LED Peak-Responding Meters And 4-Digit Electronic Tape Counter With "-" Display
- Output Level Control And Headphone Output Jack
- "One-Way," "Once-Through," And "Continuous" Playback
- Timer Record/Playback

RX-202 SPECIFICATIONS

Track Configuration	4 tracks/2-channel stereo (auto-reverse recording and playback)
Heads	2 (erase head × 1, r/p head × 1)
Motors	Transport DC servo motor (capstan drive) × 1 DC motor (reel drive) × 1 Mechanism DC motor (cam operation) × 1 DC motor (cassette reversal) × 1
Power Source	100, 120, 120/220-240, 220 or 240 V AC; 50/60 Hz (according to country of sale)
Power Consumption	30W max.
Tape Speed	1-7/8 ips (4.8 cm/sec) ±0.5%
Wow and Flutter	Less than ±0.11% WTD Peak Less than 0.06% WTD RMS
Frequency Response	20 Hz – 20,000 Hz (–20 dB recording level)
Signal-to-Noise Ratio	Dolby-C NR (A-WTD rms re 3% THD at 400 Hz) Dolby-B NR (70 μs, ZX tape) Better than 68 dB Better than 62 dB
Total Harmonic Distortion	Less than 1.0% (ZX, EXII tape) (400 Hz, 0 dB) Less than 1.2% (SX tape)
Erasure	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
Fast-Wind Time	Approx. 85 seconds (C-60)
Input (Line)	50 mV, 30k ohms
Output (Line)	0.5 V (0 dB, output control max.) 2.2 k ohms
(Headphone)	2.2 mW (0 dB, output control max.) 8 ohms
Dimensions	451 (W) × 136 (H) × 255 (D) millimeters 17-3/4 (W) × 5-3/8 (H) × 10 (D) inches
Approximate Weight	9 kg; 19 lb 13 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.



SP-7 Stereo Headphones



Tapes ZX Metalloy Cassette Tape (70 μs, metal bias) ZX C-60 ZX C-90	SX Ferricobalt Cassette (70 μs, CrO ₂ bias) SX C-60 SX C-90	EX Ferrioxide Cassette Tape (120 μs, normal bias) EX C-60 EX 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	



DM-10 Head Demagnetizer



SF-10 Subsonic Filter

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