



# Nakamichi

## 581&582

Discrete Head Cassette Deck

Nakamichi 582 Discrete Head Cassette Deck



# TWO NEW DECKS WHICH EXPAND THE HORIZONS OF CASSETTE RECORDING AS NEVER BEFORE!

## A New "Performance" Series

Nakamichi products have traditionally been associated with long-term value and unequalled performance in a wide range of price categories. And for good reason! Nakamichi cassette deck owners have found over the years that no other product offers the long-term enjoyment and investment protection designed into all Nakamichi decks. In terms of sonic performance, Nakamichi cassette decks are famous for accuracy and quality several notches above the competition, regardless of price. The all-new Nakamichi 581 and 582 Discrete 3-Head Cassette Decks carry on the tradition of unexcelled value and performance at a time when these basic goals appear to be giving way to glitter and gimmickry.

The 581 and 582 are the results of an intensive effort to maximize essential parameters, such as performance and reliability, while minimizing unimportant features which only serve to increase cost. Of course, convenience features, which make the decks easier and more enjoyable to use, have not been neglected. And since Nakamichi has always believed cassette decks should be pleasing to the eye as well as the ear, the 581 and 582 live up to Nakamichi's reputation of unique and attractive styling. But you simply will not find any "frills" on these decks. If expensive-looking, metal front panels and many flashing lights are more important to you than basic performance, the Nakamichi 581 and 582 are not for you! In order to deliver the maximum performance for the money, the 581 and 582 take advantage of the latest in Nakamichi's world reknown magnetic head, transport and electronic circuit design technologies. The 581 and 582 also represent Nakamichi's first production cassette decks capable of recording on the latest innovation in magnetic tape technology: the metal-particle or metal-alloy (metalloy) tape.

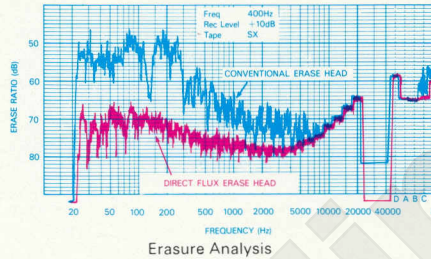
## Head Technology

### The 2nd Generation Direct-Flux Erase Head

Very few tape enthusiasts would be surprised if they were told that anything short of total erasure has audible consequences. Yet, equally few are aware that conventional erase heads are not only inadequate, they actually "record" noise onto virgin or bulk-erased tape. This noise is then modulated by the signal at the record head. If this is the case with conventional tapes, the situation is much worse

with metalloy tape because of the latter's tremendous coercive force (approximately twice that of chromium dioxide and equivalent formulations).

The Nakamichi 581 and 582 incorporate Nakamichi's "2nd Generation Direct-Flux Erase Head". This head represents radically new materials and proprietary construction techniques. A single pass over Nakamichi's Direct-Flux erase head, in fact, is equivalent to thorough bulk erasure. The typical performance graph below attests to the unusual capabilities of this erase head.

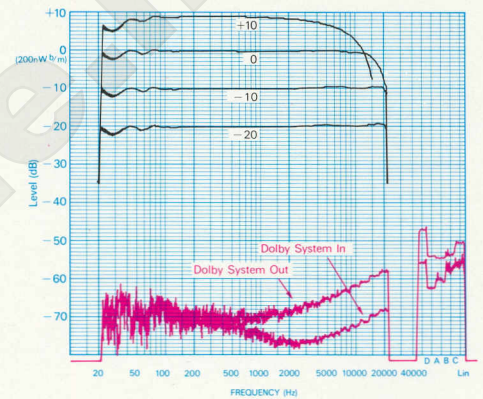


## Crystalloy Record and Play "SuperHeads"

Nakamichi was the first to achieve flat response to 20,000 Hz with a two-head cassette deck. This achievement was made possible through the use of Nakamichi's "SuperHead", a narrow-gapped record/play head which minimized the inevitable compromises in a two-head design by reducing core saturation effects during record. The same techniques used in the manufacture of the original SuperHead, plus newly developed miniaturizing techniques, have been applied to produce the new record-only Crystalloy SuperHead used in the 581 and 582. This new record head employs a 3.5 micron gap, producing an extremely sharp "critical zone" for full penetration of the tape coating. The resulting recordings are unusually wideband and distortion-free. Above all, it is capable of handling the high bias required for proper recording on metalloy tape. The playback head used in the 581 and 582 also features a Crystalloy core, but with a critically formed 0.9 micron gap. This exceptionally precise construction ensures ultra-clean reproduction of the highest frequencies. Nakamichi Crystalloy is unique among magnetic head materials in that it exhibits very low residual magnetism effects. This property accounts for Crystalloy's excellent low-level linearity, an

important advantage for playback applications. Low-level linearity affects distortion components "below the noise" and has plainly discernible effects on reproduction clarity. In this regard, the Crystalloy playback head is absolutely unsurpassed by competing designs.

Both the record and play Crystalloy SuperHeads are extremely long-life devices thanks to surface "cut-outs" which promote uniform wear. In laboratory tests, Nakamichi SuperHeads have provided more than 10,000 hours of useful life with little degradation of performance.



Nakamichi 581/582 Frequency Response/Noise Analysis  
Tape Nakamichi ZX  
Eq: 70  $\mu$ s

## The Discrete Head Configuration

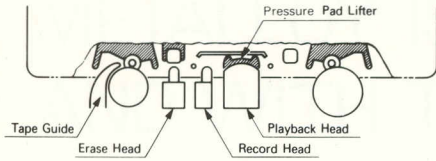
As the manufacturer of the world's first true three-head cassette deck, Nakamichi has a rather unique perspective on the problems associated with three-head design. The vagaries of the plastic cassette housing pose a threat to tape travel accuracy especially when the record and play heads are physically separated. In recent years, numerous three-head cassette decks have attempted to minimize the effects of housing-induced tape skew by using what is now often referred to as the "combination" or "sandwich" head. Although combining the record and play heads into a single unit seems like a good idea on paper, decks employing the combination head far poorly, barely managing to outperform mediocre two-head machines! Among the reasons for the combination head's poor performance are 1) the close proximity of the record and play cores, which produces bias

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## Discrete 3-Head Cassette Deck



leakage and crosstalk; 2) the enlarged head-to-tape contact area, which causes pronounced "scrape" flutter and increased susceptibility to pressure pad variations; 3) an increased number of physical "edges" in close succession, which exacerbates contour "bumps" and 4) the inability to adjust record and play azimuths independently. This last consideration is very important because Nakamichi's research has shown that "physical" azimuth and "magnetic" azimuth may not be one in the same. Regardless of the tolerances to which a combination head may be manufactured, therefore, physically parallel gaps are no guarantee of proper azimuth alignment.



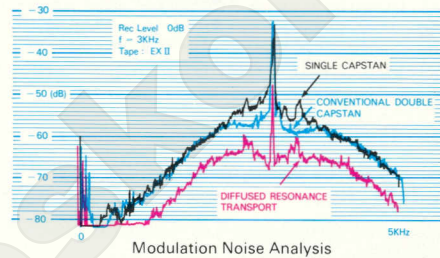
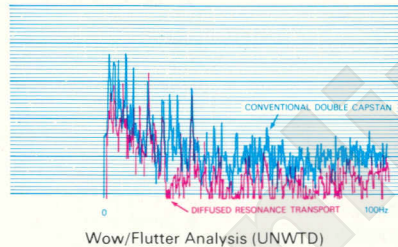
The 581 and 582 incorporate Nakamichi's novel Discrete Head Configuration.

As with the combination head, both record and play heads are inserted into the center opening, thereby eliminating housing-induced skew. But the similarity ends there. As illustrated above, the two heads are totally distinct despite their close proximity. The azimuths are independently adjustable so that each head can be factory-aligned for optimum performance. The heads have small radii of curvature for reduced contact area, which minimizes dropout and contour effect. The playback head is fitted with special pad lifters which push the cassette's pressure pad out of the way when the head is inserted. (The pressure pad is non-essential in an advanced double-capstan transport, such as the one used in the 581 and 582.) Pressure pad variation from cassette to cassette thus ceases to be a problem, and this ensures more uniform head wear. Finally, the two heads are independently mounted and shielded to prevent interference caused by crosstalk and bias leakage.

### The Asymmetrical Diffused Resonance Transport

The advantages of a closed-loop, double-capstan tape drive system are well known. Not so well known is that the use of two capstans creates new problems which were non-existent with a single capstan. Most of these problems are the result of additive resonances. The Diffused Resonance transport found in the Nakamichi 581 and 582 combats resonances in the 0-20 Hz (wow) region by making

certain that no two moving parts have the same mass or rotate at the same speed. Each capstan, pressure roller and flywheel has a unique diameter. Since they rotate at different speeds, the various components produce a random distribution of resonances. Resonances in the 20-100 Hz (flutter) region, which are caused by vibrations (such as motor vibration), are controlled with the use of new, non-resonant metals and plastics in critical transport areas. These materials actually damp vibrations which originate from the various moving parts and keep them from reaching the capstans. Spectral analysis of the Diffused Resonance transport (see below) reveals a marked reduction in regular resonant peaks between 0-20 Hz when compared to a conventional double-capstan transport. Overall unweighted wow and flutter are significantly lower. Careful attention to transport resonances, furthermore, results in a dramatic reduction in modulation noise. The Diffused Resonance transport thus brings new definition and clarity to the sonic performance of the 581 and 582 cassette decks.

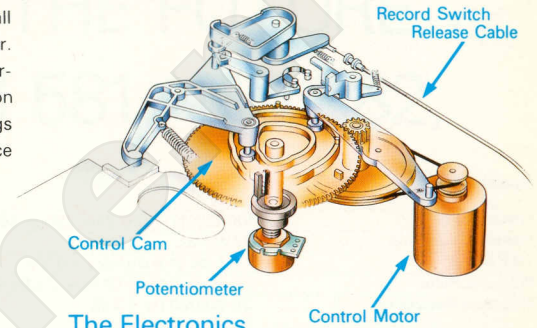


### The Transport Control System

The control system employed in the 581 and 582 is entirely without precedent. Rather than relying on the conventional IC logic/solenoid combination, the new Nakamichi transport is built around an elegant motor-driven cam system with highly simplified C-MOS logic. Of the three motors used in the 581/582 transport, one is used to drive the capstan, and another is used to drive the reel hubs. The third motor, however, is not directly related to tape

drive. It is used to drive a control cam, the rotation of which triggers specific chains of events. These "events" may include brake action, head base movement, reel motor actuation, pressure roller engagement, amplifier activation and muting release.

The advantages of this unique transport control system are multifold: 1) the elimination of solenoids results in quieter, smoother operation; 2) solenoid "hold" current is no longer required, which means reduced power consumption and less internally generated heat; 3) motor-governed head insertion/retraction eliminates the need for dampers and reduces shock which may affect critical head alignments; and 4) the cam-controlled configuration maintains high reliability by reducing logic complexity.



### The Electronics

The added signal-handling capability of metalloy tape not only poses new requirements on magnetic heads but related circuitry as well. The 581 and 582 benefit from Nakamichi's innovative circuit design, which has always been several steps ahead of convention. The record and playback amplifiers in the 581 and 582 utilize the double negative feedback (NF) configuration proven successful in Nakamichi preamplifiers and power amplifiers. Instead of the usual single feedback path, Nakamichi's design provides two paths, a DC loop and an AC loop. In addition, the series electrolytic capacitor normally found at the output of the record amplifier has been eliminated. The DC path contributes to improved low-frequency phase coherency, superior linearity, and lower recording distortion. The AC feedback loop, nevertheless, maintains high amplifier stability, which would not be possible with a DC path alone.

### Why 2 models?

The 581 and 582 are more alike than they are different. Both share the identical Discrete 3-Head Configuration. Both decks have the same 3-motor Diffused Resonance Transport. Both decks provide three tape selector positions: EX (ferric oxide),

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## Discrete 3Head Cassette Deck



SX (chrome equivalent) and ZX (metalloy). As a matter of fact, both decks have exactly the same performance specifications.

The only difference between the two is that the 582 provides monitoring capability while the 581 does not. (There is an appropriate difference in price, of course.) The 582 is a "full-fledged" three-head deck with two complete sets of electronics (record and playback) for each channel. "Double Dolby" noise reduction, furthermore, enables you to monitor a fully decoded signal. The 581, even though it does have three heads, only has a single set of electronics for each channel; the electronics are switched for record or play. The 581 is thus functionally similar to a two-head deck.

Why bother making a three-head deck which operates like a two-head deck? Nakamichi has always believed that the true advantage of a three-head design over its two-headed counterpart is not the ability to monitor the recording in progress but rather the ability to independently optimize the magnetic properties and gap length of the head for the record and playback processes. Only by separating the record and play heads can the designer optimize the variables for each process. A two-head deck, no matter how sophisticated it may be, represents a compromise in performance. With the 581, the only compromise involved is a minor sacrifice in convenience. It offers the performance that only a true three-head deck can provide, but at significantly lower cost. If monitoring capability is not important to you, the money you would save by choosing the 581 over the 582 can be used to augment another part of your stereo system.

## Special Features

The 581 and 582 are designed with a thoughtful selection of features which make them convenient and enjoyable to use.

## User-Adjustable Rec Cal and Bias

The 581 and 582 feature built-in test tones and front panel access to record calibration and bias adjustment controls. There are two test tones: a 400 Hz, 0 dB (0 dB = 200 nWb/m) tone for rec cal, and a 15 kHz, -20 dB tone for bias adjustment. Record calibration enables adjustment for varying tape sensitivities and is essential for proper Dolby system tracking. Bias adjustment enables the user the "tune" the deck to precisely match the characteristics of the tape in use. Both adjustments are simple to perform, and they ensure that the 581 and 582 will provide optimum performance with a wide range of high-quality tape formulations.

When the 15 kHz test tone is selected, the peak level meters of the 581/582 are programmed to read 20 dB higher than normal. Thus, a record level of -20 dB would read "0 dB" on the meters. This ensures a more accurate bias adjustment by shifting to a more precise and expanded portion of the meters' scales.

Even though the 581 lacks monitoring capability, it features a particularly useful system for simplifying calibration procedures. Since there are three heads, the test tone generator is connected directly to the record head when either of the tones is selected during the record mode. This frees the amplifier (and meters) to monitor the test signal "off-the-tape" using the play head. In the rec cal or bias adjust modes, therefore, the 581 makes full use of its three heads.

## "Clickless" Pause

Since a motor can be stopped anywhere in its motion (unlike a solenoid, which is either all the way in or out), the 581/582 transport lends itself to a pause feature more useful than most. In pause, the heads stay

engaged — only the pressure rollers disengage. When recording, this means start-ups and stops are instantaneous, without any "clicks" put on the tape.

## High-Speed Cueing

The 581 and 582 feature high-speed cueing, a convenience normally found only on professional open-reel decks. If you press the 581/582's pause/cue button during fast-forward or rewind, the play head will move up and barely contact the moving tape. The playback amplifier is activated and the winding speed is reduced to one-third of its original speed. You can further reduce winding speed at this point by pressing and holding either the fast-forward or rewind button. In this manner, you can "rock" the tape back and forth until you've located the desired spot. To come out of the cueing mode, simply push the stop or play button.

## Timer Operation

With the addition of any ordinary appliance timer, the 581 and 582 can be used for unattended recording or playback at a pre-selected time of day. When the timer switch on the 581/582 is activated, the deck is automatically programmed to begin recording or playing when the power comes on, depending on which you've selected. For accurate starting times, a digital timer, such as the Nakamichi DS-200, is highly recommended.

## Remote Control

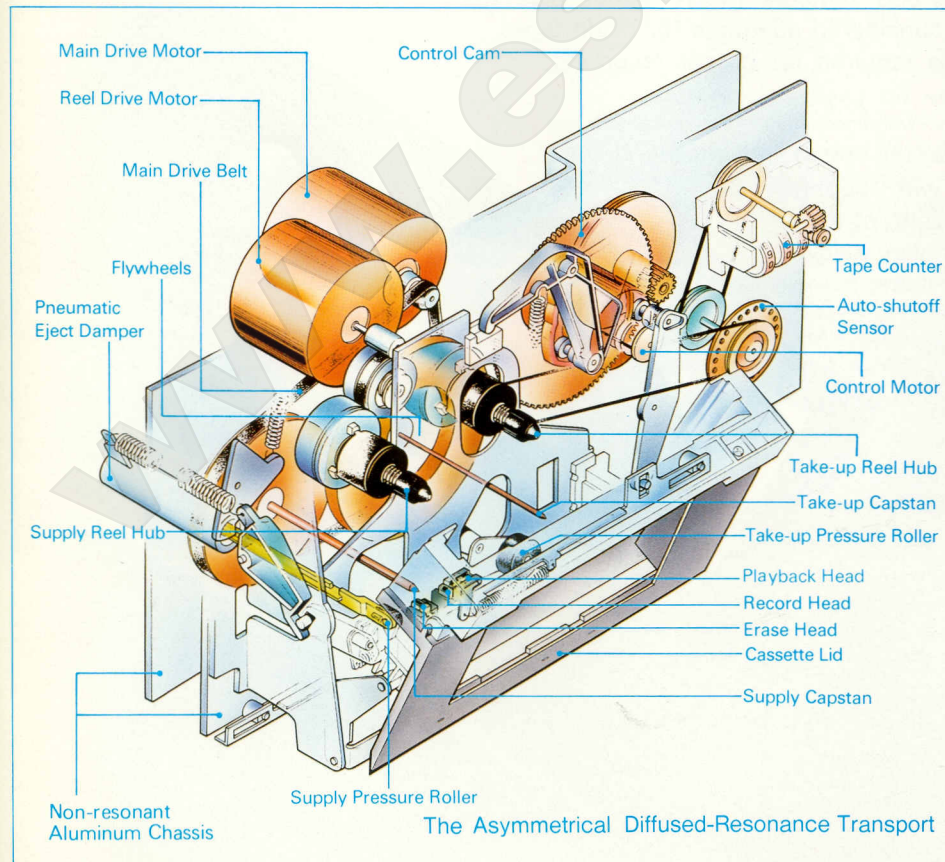
The logic-controlled transport naturally lends itself to remote control operation. With the 581/582, you have the choice of two optional remote controls which duplicate all of the front panel transport functions, including cueing. The RM-10 is a remote control with 5 meters (15 ft.) of cable. The RM-580 is a wireless remote control system which comes in two sections: a transmitter and a receptor. The latter is plugged into the 581/582 and placed near the deck. The battery-operated transmitter sends commands encoded in 7-bit pulse-code-modulation using an infra-red carrier. You can control the 581 or 582 from as far as 10 meters (30 ft.) away as long as you maintain direct line-of-sight between the transmitter and receptor.

## DC Output Jack

The 581 and 582 both have rear panel connectors which can be used to power the Nakamichi BlackBox Series accessories. This eliminates the need for the separate power supply (PS-100) which is otherwise required to operate the BlackBox components. The Nakamichi Blackbox Series includes the MX-100 Microphone Mixer, SF-100 Subsonic Filter and LA-100 Line Amplifier among others.

## The Nakamichi "Regulars"

- Dolby Noise Reduction System
- Separate Bias and Eq Selectors
- Defeatable MPX Filter
- Tape-Start Memory
- 47 dB-Range Peak Level Meters
- Full IC Logic w/Total Tape-End Shutoff
- High-Output Headphone Amplifier.



# METALLOY IS THE TAPE OF THE FUTURE... AND WITH THE NAKAMICHI 581 AND 582, THE FUTURE IS NOW.

Metalloy is a genuine breakthrough in magnetic tape recording. This new type of tape is the result of several years of research by the world's leading tape manufacturers. Although metalloy tape is similar to conventional tapes in physical appearance, its performance far exceeds that of "premium" oxide formulations. Metalloy's coating consists of super-fine, pure iron-alloy particles, whereas conventional tape coatings consist of oxide particles (as in ferric oxide or chromium dioxide). Metalloy tape is thus capable of storing higher levels of magnetic energy than any previous tape formulation.

Conventional cassette decks, unfortunately, cannot take advantage of metalloy tape because it is much more difficult to erase and requires much higher bias than conventional tapes. Erase and record heads considered adequate for oxide tapes simply cannot handle the high current levels required for proper recording on metalloy.

The Nakamichi 581 and 582 incorporate the most advanced magnetic heads in the world. Coupled with sophisticated electronic circuitry, they not only provide state-of-the-art recording capability with metalloy tape, but also yield dramatic sonic improvement with conventional oxide tapes. So good is the performance of the 581 and 582 with conventional tapes that most users will find it unnecessary to incur the extra expense of metalloy for most applications. But as improvement in program material and advance in listening sophistication make increasing demands on cassette performance, the 581, 582 and metalloy tape will stand ready to face any challenge.

To demonstrate the incredible capabilities of this new technology, each Nakamichi 581 and 582 comes with a pre-recorded metalloy cassette. This demonstration cassette consists of studio-quality master recordings duplicated on the very 581 or 582 with which it is packed. The duplication is performed at the Nakamichi factory as part of a rigorous quality-control program.

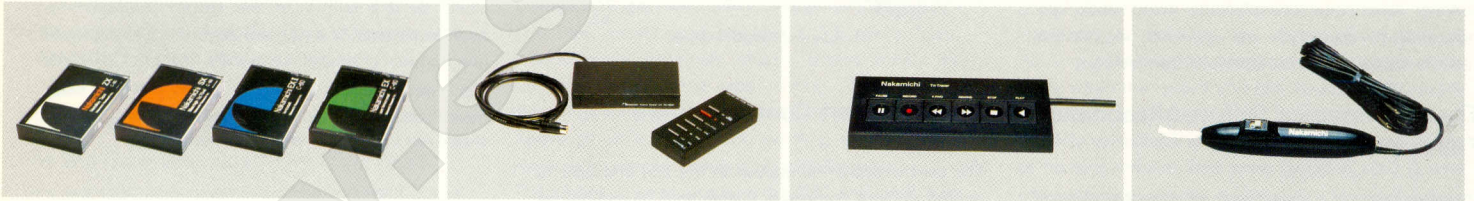


Specifications:

Power Source	100,120, 120/220-240, 220 or 240V; 50/60Hz
Power Consumption	2.7 W Max.
Tape Speed	1-7/8 ips. (4.8 cm/sec.) $\pm$ 0.5%
Wow and Flutter	Less than 0.1% WTD Peak, 0.05% WTD rms
Frequency Resoponse	20-20,000 Hz $\pm$ 3 dB (-20 dB Rec. Level)
Signal to Noise Ratio	Better than 60 dB at 400 Hz, 0 dB, IHF-A WTD rms
(Dolby NR In, ZX Tape)	Better than 66 dB at 400 Hz, 3% THD, IHF-A WTD rms.
Total Harmonic Distortion	Less than 0.8% at 400 Hz, 0 dB, ZX Tape Less than 1.0% at 400 Hz, 0 dB, SX, EXII Tape
Erasure	Better than 60 dB below saturation level at 1 kHz ZX Tape
Separation	Better than 37 dB at 1 kHz, 0 dB
Crosstalk	Better than 60 dB at 1 kHz, 0 dB

Bias Frequency	105 kHz
Input	50mV, 50 k ohms
Output Level	1V (400 Hz, 0 dB, Output Level at Max) 2.2 k ohms
Headphone	45 mW
DC Output Jack	$\pm$ 10V 125mA Max
Dimensions	500(W) $\times$ 130(H) $\times$ 350(D) m/m 19-11/16(W) $\times$ 5-1/8(H) $\times$ 13-25/32(D) inches
Approximate Weight	8.3 kg, 18 1b 5 oz.

- Specifications and appearance design are subject to change for further improvement without notice.
- Dolby NR under license from Dolby Laboratories.
- The word "DOLBY" and the Double-D-Symbol are trademarks of Dolby Laboratories.



ZX Cassette Tape C-60, C-90  
SX Cassette Tape C-60, C-90  
EXII Cassette Tape C-60, C-90  
EX Cassette Tape C-60, C-90

RM-10 Remote Control

RM-580  
Wireless Remote Control

DM-10 Head Demagnetizer

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