The Premier Advanced Recording Technology Forum

THIC Inc.

Thin Tape Handling in a Helical Scan Tape Platform

Mammoth Tape

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Thin Tape Handling in a Helical Scan Tape Platform

MammothTape™

Superior Technology to Safeguard Your Data

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The Drive Toward Thinner Tape

- Server applications require increased capacity
- Disk capacities double every 12 to 18 months
- Tape capacity must increase to match disk capacity
- Thinner tape allows more media to be wound into a cartridge which provides additional capacity

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Tape Thickness History

Year	Thickness (um)	Base Film	Tape Length (m)
1980	13	PET	54
1985	10	PET	112
1992	7	PET	160
1997	7.7	PET	170
1999	5.5	PEN	230

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What About PA Media?

- Polyaramid (PA) media has the same thickness as PEN, with strength similar to PET
- But ...
  - PA base film is 50% more expensive
  - PA base film does not bond well AME coatings
  - PA is not a video consumer based product

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The PET to PEN Transition

- PEN is stronger and stiffer than PET, but not enough to overcome the 23% reduction in thickness
- Two factors to consider
  - Tape path guiding - Tape edges must be protected from damage
  - Tape to head interface - Minimize tape wear while maintaining head to tape interface

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Guiding and Moving Thin Tape

- Capstan-free tape path
- Improved guides
- Optimized alignment
- Gentle servo system

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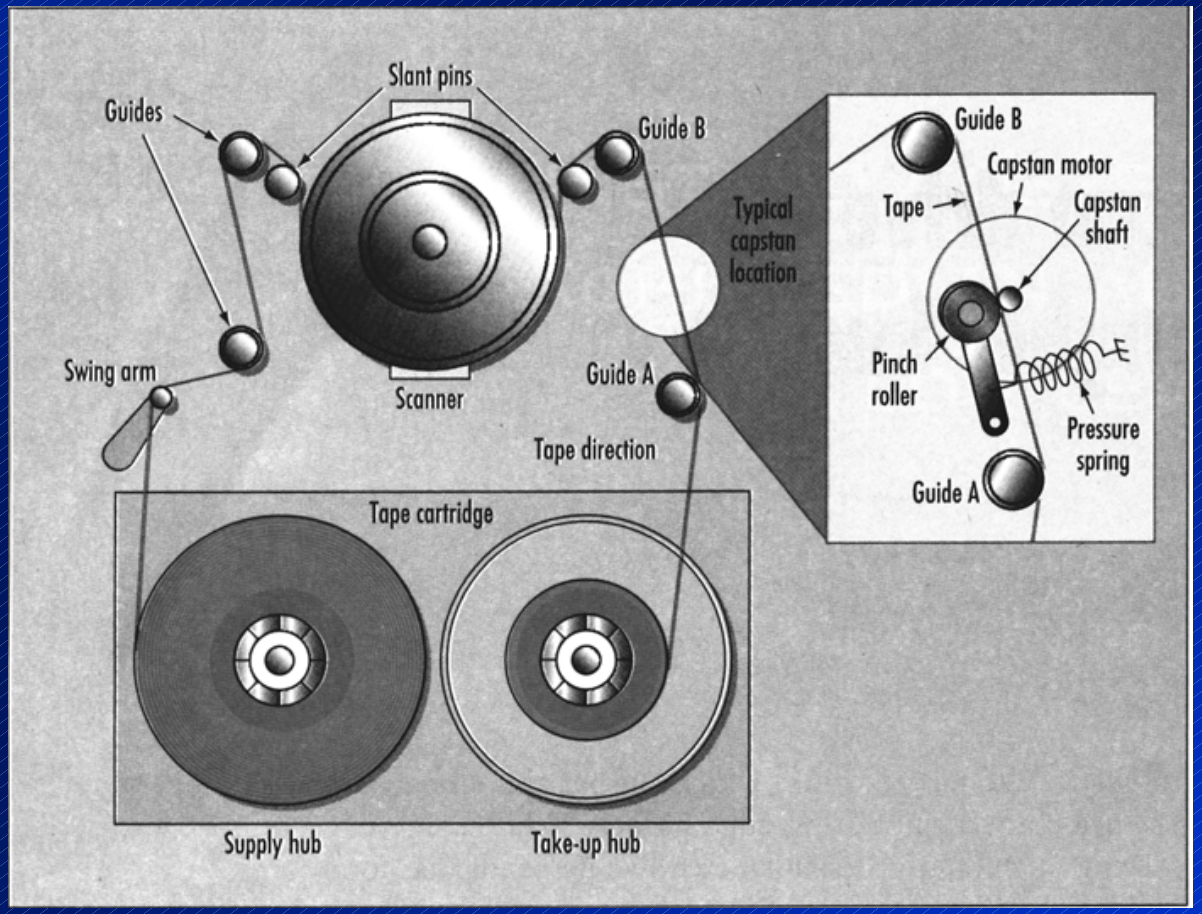
Capstan Free Tape Path

- The Mammoth tape path moves tape without a capstan and pinch roller
- Capstan and pinch roller systems are the primary cause of media damage



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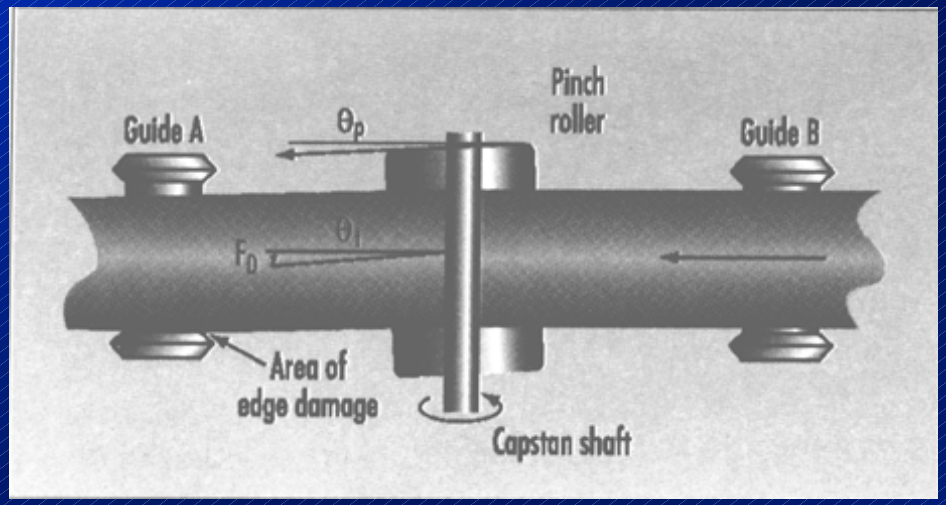
Why Capstans Damage Media



- Capstan systems must have perfect alignment between the capstan and pinch roller
- If there is misalignment, tape is forced up or down into Guide A
- Edge damage results

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Improved Guides

- Large diameter guides
- Highly polished tape guide flanges
  - Smoothest possible surface to guide the edge of the tape
- Tight tolerance between the roller and the flange
  - Better support across the full width of the tape

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Alignment

- Tape path alignment is performed with PEN media
- Alignment process is controlled with precision optics and electronics
- Alignment is checked with thicker PET media

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Gentle Servo System

- Smooth velocity profiles
  - Minimizes acceleration spikes
  - Decreases tension gradients
- Precision tension control
  - Eliminates tension transients during backhitch and high speed operations

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Tape to Head Interface

- The tape to head interface must be engineered to handle the thin PEN, but also be backward compatible with the thicker PET media.

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Tape to Head Interface

- Conditioning Heads
- Head Protrusion
- Groove Design
- Head Window Design

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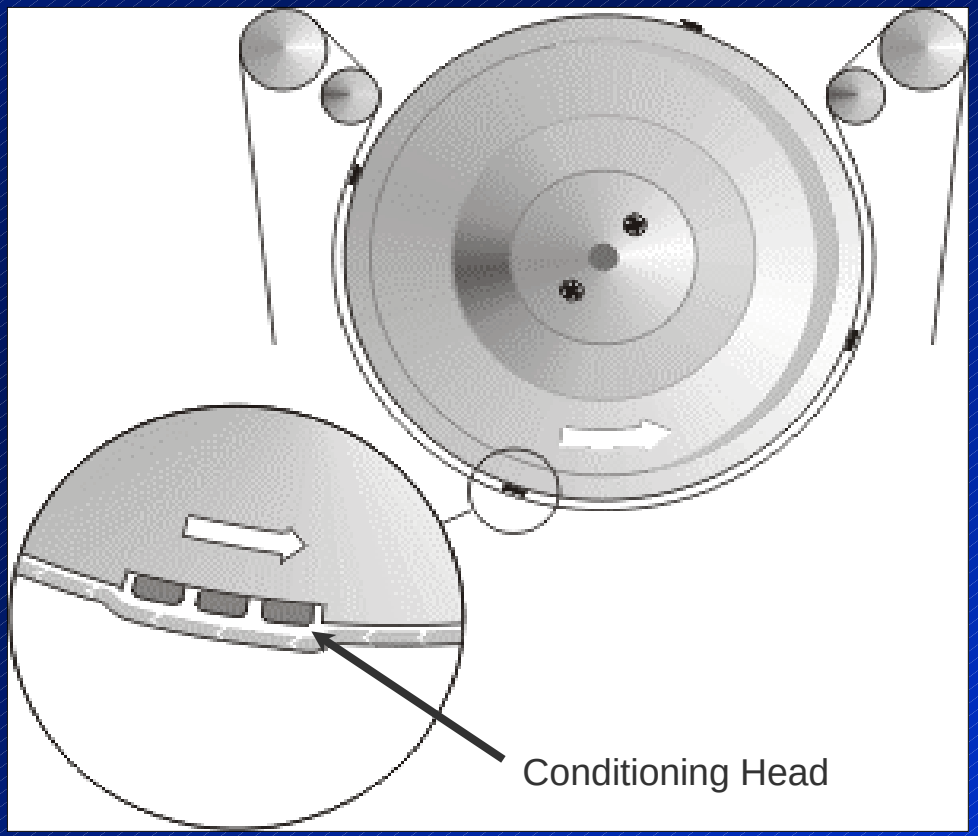
Conditioning Heads

- A conditioning Head is placed in front of each pair of active heads
- Modifies the air flow
- Stabilizes the head to tape interface
- Height, shape, and material are critical



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Head Protrusion

- The stability provided by the conditioning heads allows for minimal head protrusion
- With less protrusion, thin PEN tape now contours across the heads the same as thicker PET media.
- Both PEN and PET media contact only the tip of the head

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Scanner Groove Design

- Controls air cushion between the tape and the scanner
- Too much air causes the tape to lose contact with the heads
- Too little air cause media wear due to contact between the tape and scanner

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Head Window Design

- The head windows are the holes where the heads protrude from the scanner
- The head windows control the break down of the air cushion allowing contact between the tape and heads
- Analogous to a spoiler on a race car

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Future Media Technology

- Thinner base films
  - 4.3 um to 4.7 um
  - 270 meters of tape in a 8 mm cartridge

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Thank You