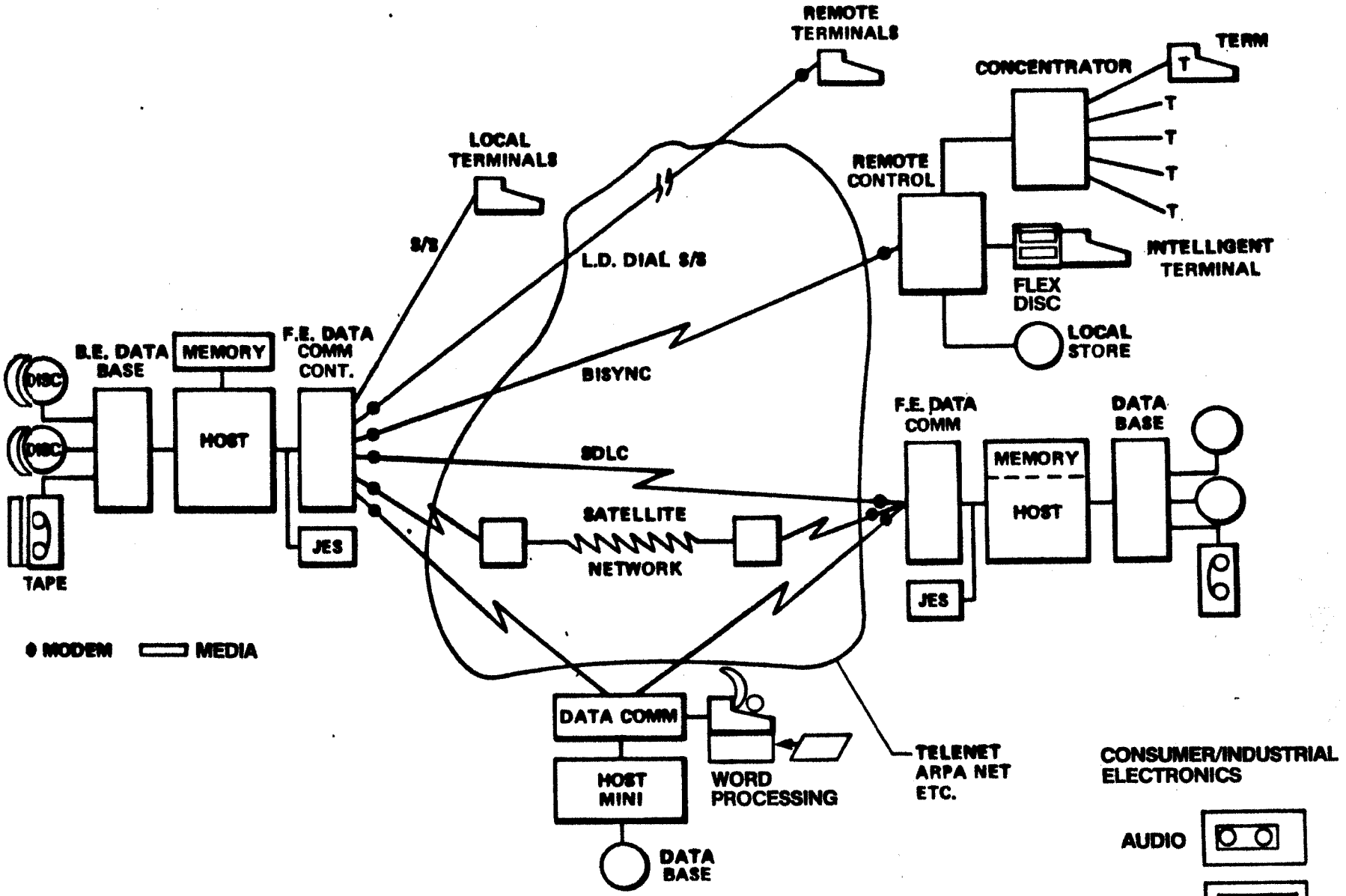
INFORMATION STORAGE TECHNOLOGY

EVOLUTION

Steven H. Puthuff

MEMOREX
INFORMATION STORAGE AND COMMUNICATIONS



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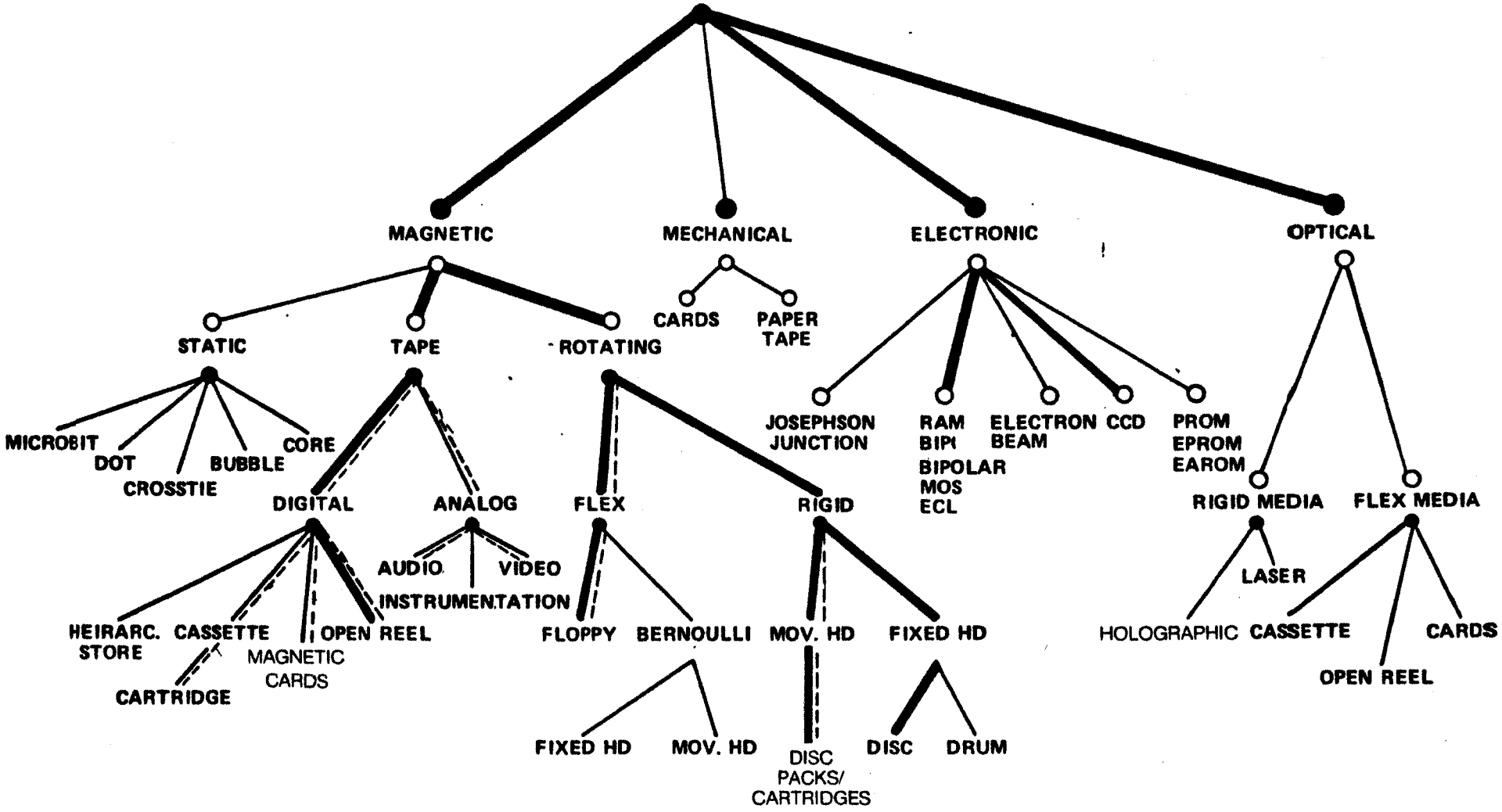

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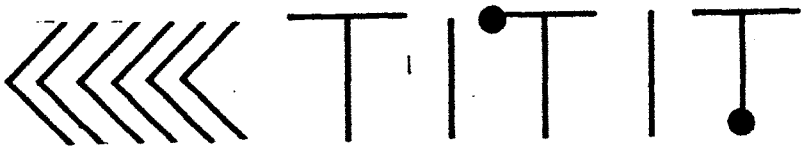
BUBBLE MEMORY TECHNOLOGY



INFORMATION—CYLINDRICAL DOMAINS IN FERRO MAGNETIC FILM

TECHNOLOGIES

- PERMALLOY BAR
- BUBBLE LATTICE
- CONTIGUOUS DISK
- CURRENT ACCESS
- WALL DOMAINS

ADVANTAGES

- NON-VOLATILE
- DENSITY—1.5×10^7
- FEW PROCESS STEPS
- REMOVABLE MEDIA

DISADVANTAGE

- SHIFT SPEED—100K—300K BPS

DEVELOPED BY

- HEWLETT-PACKARD
- IBM
- AT&T
- BURROUGHS
- NEC
- PHILIPS
- SIEMENS
- TI
- ROCKWELL
- INTEL
- NATIONAL
- PLESSEY
- HITACHI
- FUJITSU
- SPERRY/UNIVAC
- SINGER

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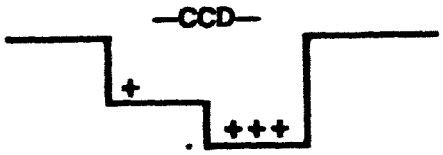
CHARGE-COUPLED DEVICES



INFORMATION STORED VIA CHARGE
IN POTENTIAL WELL MOS STRUCTURE

ADVANTAGES

- PROVEN TECHNOLOGY
- DATA RATE—5-10 M BPS
- ACCESS TIME—1 MS

DISADVANTAGES

- VOLATILE
- COST

DEVELOPED BY

- PRODUCT

  FAIRCHILD
  TI
  INTEL
  NCR
  NEC

- LAB ONLY

  RCA
  IBM
  PHILIPS
  NATIONAL
  TRW
  MOTOROLA
  TOSHIBA
  SONY
  MITSUBISHI

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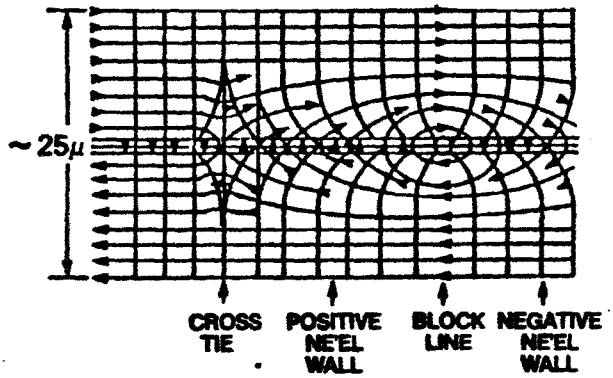
CROSSTIE MEMORY



NI-FE THIN FILM—GLASS SUBSTRATE

ADVANTAGES

- NON-VOLATILE
- DATA RATE—20 MB/S
- DENSITY—10^8-10^9 B/IN^2
- FEW PROCESS STEPS

DISADVANTAGES

- NEW TECHNOLOGY

DEVELOPMENTS—

- NAVAL ORDINANCE LAB

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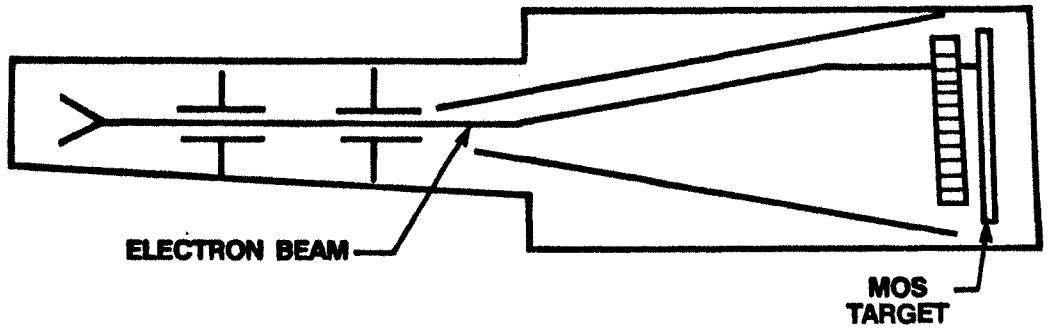
ELECTRON BEAM MEMORY



ADVANTAGES

- ACCESS TIME—10 μS
- NON-VOLATILE
- DENSITY—8× 10^8 B/IN.^{2}
- DATA RATE—10 M BPS

DISADVANTAGES

- COMPLEX CONTROL ELECTRONICS
- PRECISION POWER
- DIFF. READ/WRITE RATE
- LIFETIME
- RECIRCULATE MEMORY

DEVELOPED BY

- SRI
- MICROBIT (CDC/EXXON/SPRAGUE/AMDAHL)
- GENERAL ELECTRIC

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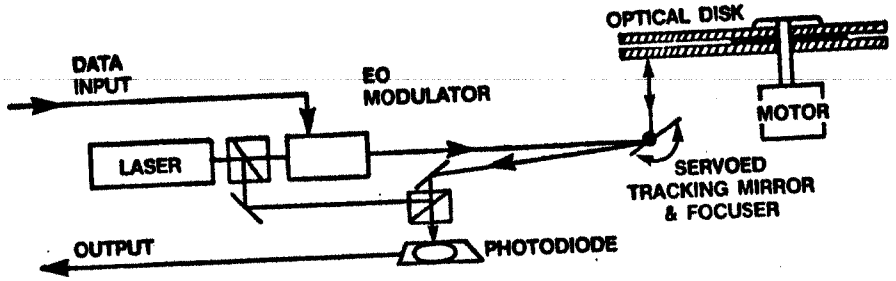
TECHNOLOGY EVOLUTION AT MEMOREX

OPTICAL DISC STORAGE



ADVANTAGES

- HIGH AREA DENSITY (1250 MB/SIDE - 12 IN DISC)
- NON-CONTACT RECORDING
- LOW COST POTENTIAL 50 MICROCENT/BIT

DISADVANTAGES

- READ ONLY
- NEW TECHNOLOGY

DEVELOPED BY:

- PHILIPS/MCA
- RCA
- XEROX
- EXXON
- AMPEX
- CORNING GLASS
- OMEX

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RANDOM ACCESS MEMORY TECHNOLOGY

TYPE	ACCESS TIMES (NS)	CHIP SIZE	APPLICATION
JOSEPHSON JUNCTION	0.2		MILITARY
ECL	10-30	256B (1977)	BUFFER
TTL	40-100	1K, 4K	BUFFER
N-MOS	50-350C	1K, 4K, 16K	MAIN FRAME
I^2L	50-100	1K, 4K, 16K	MAIN FRAME
SOS	100	1K	PERIPHERALS
MOS	150-350	4K, 16K	SMALL MAIN FRAME
C-MOS	300-500	1K	SMALL MAIN FRAME
D-MOS	100 NS	65K (1978)	
DOUBLE DIFFUSED MOS			
V-MOS	100-200 NS	262K (1980)	
V-NOTCH MOS			
GTL—GOLD TRANSISTOR LOGIC	10NS		

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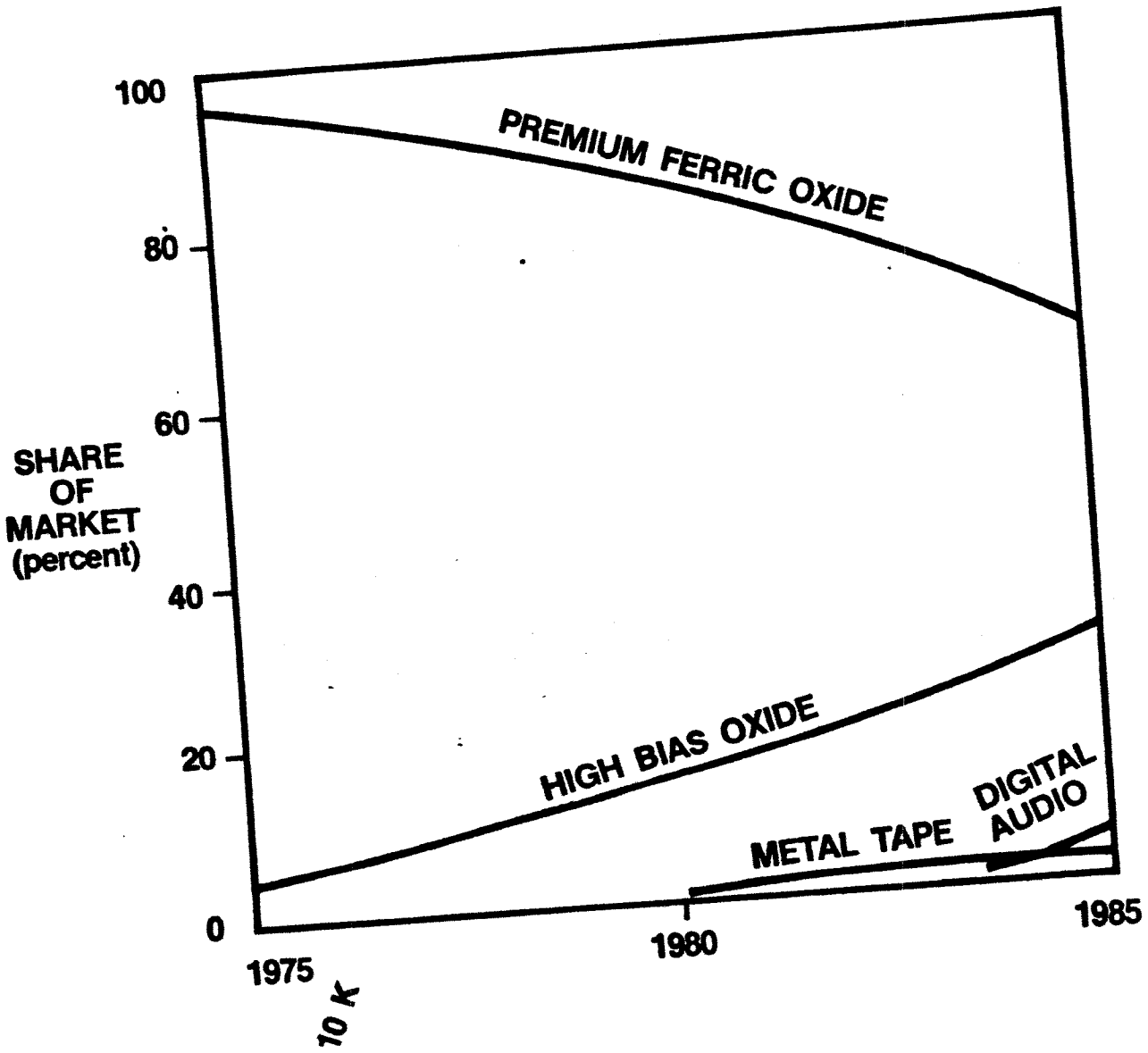
AUDIO TAPE TECHNOLOGIES



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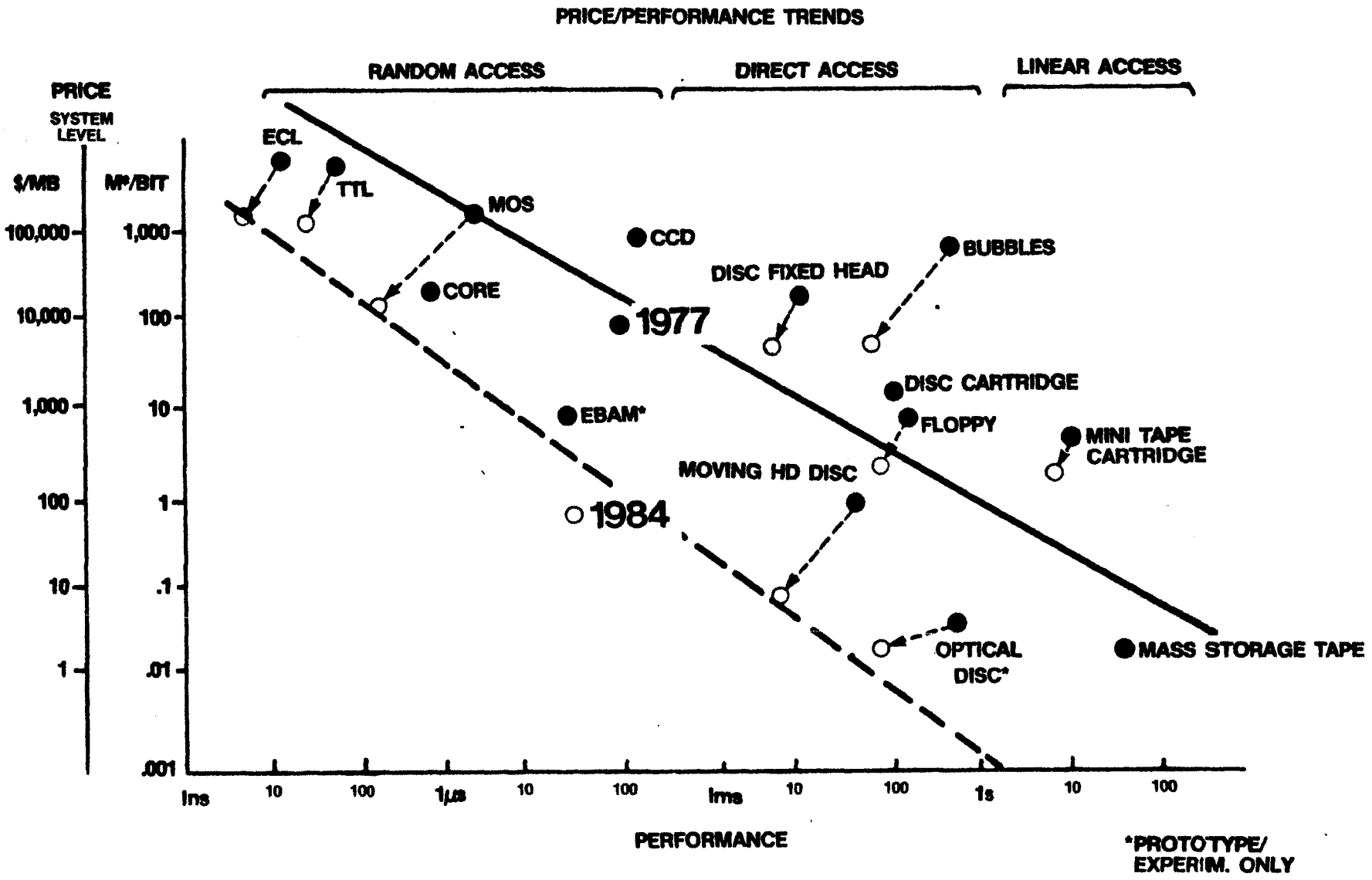
DIGITAL STORAGE TECHNOLOGY



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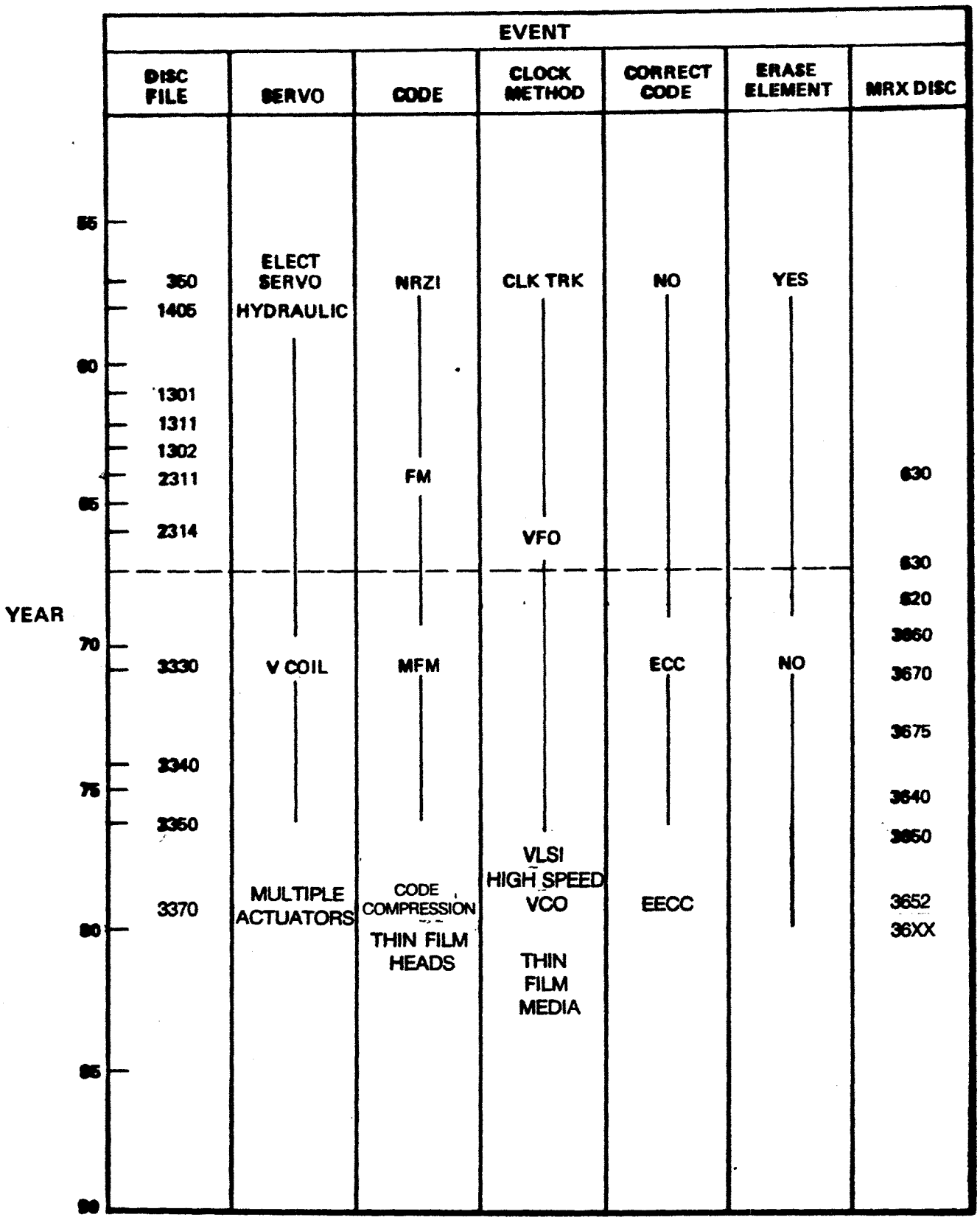

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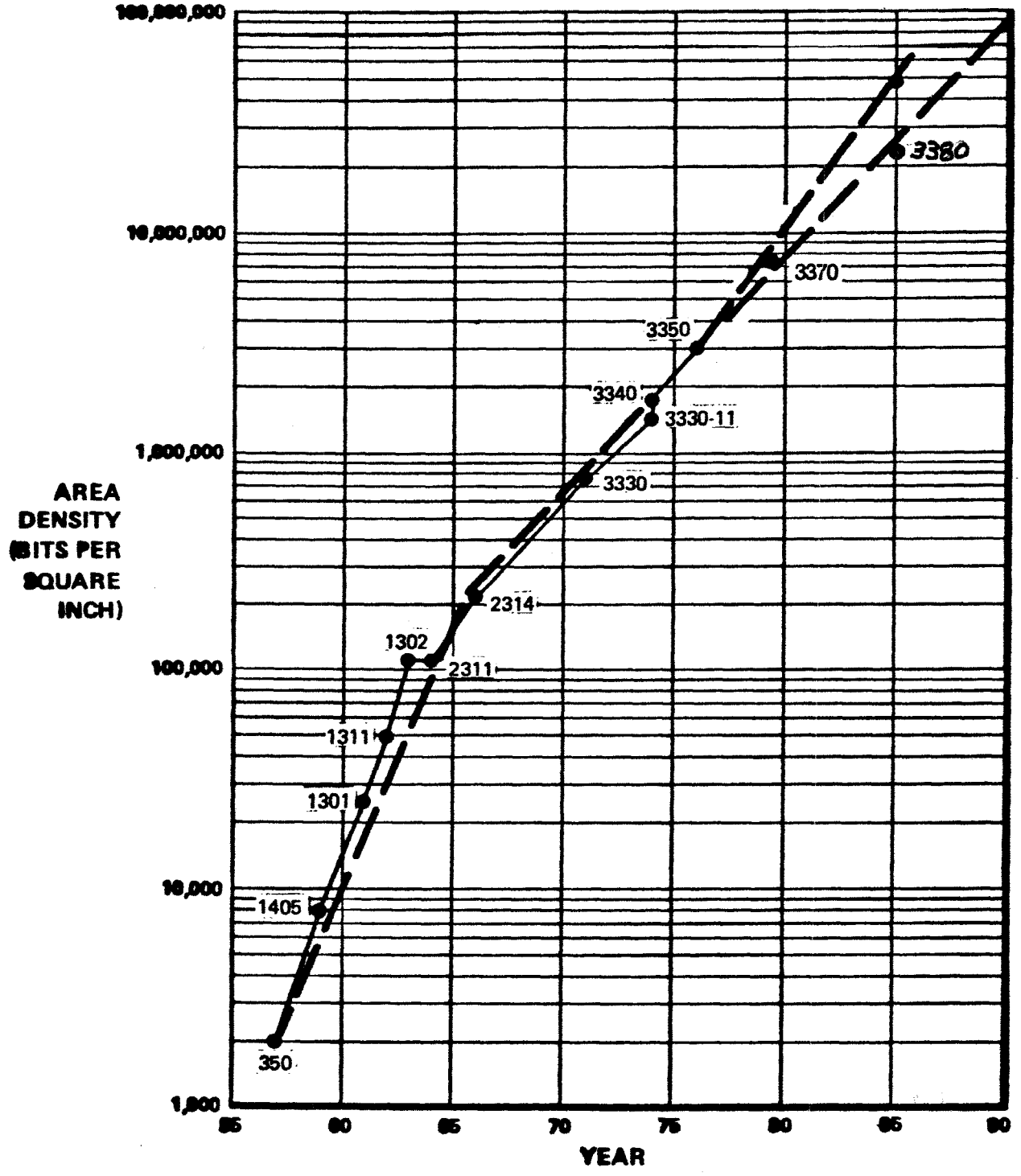

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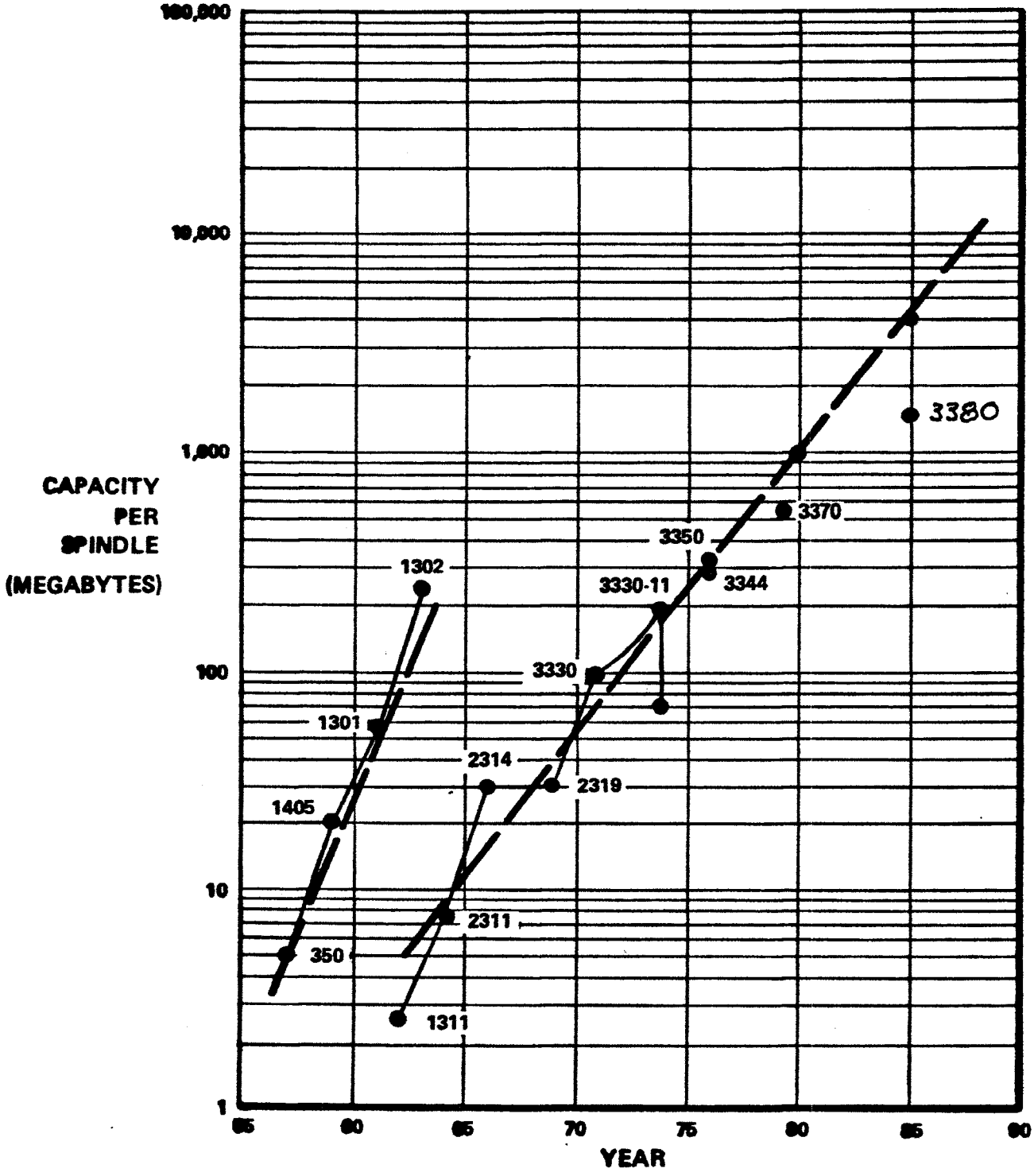

15,000 BPI

1,900 TPI

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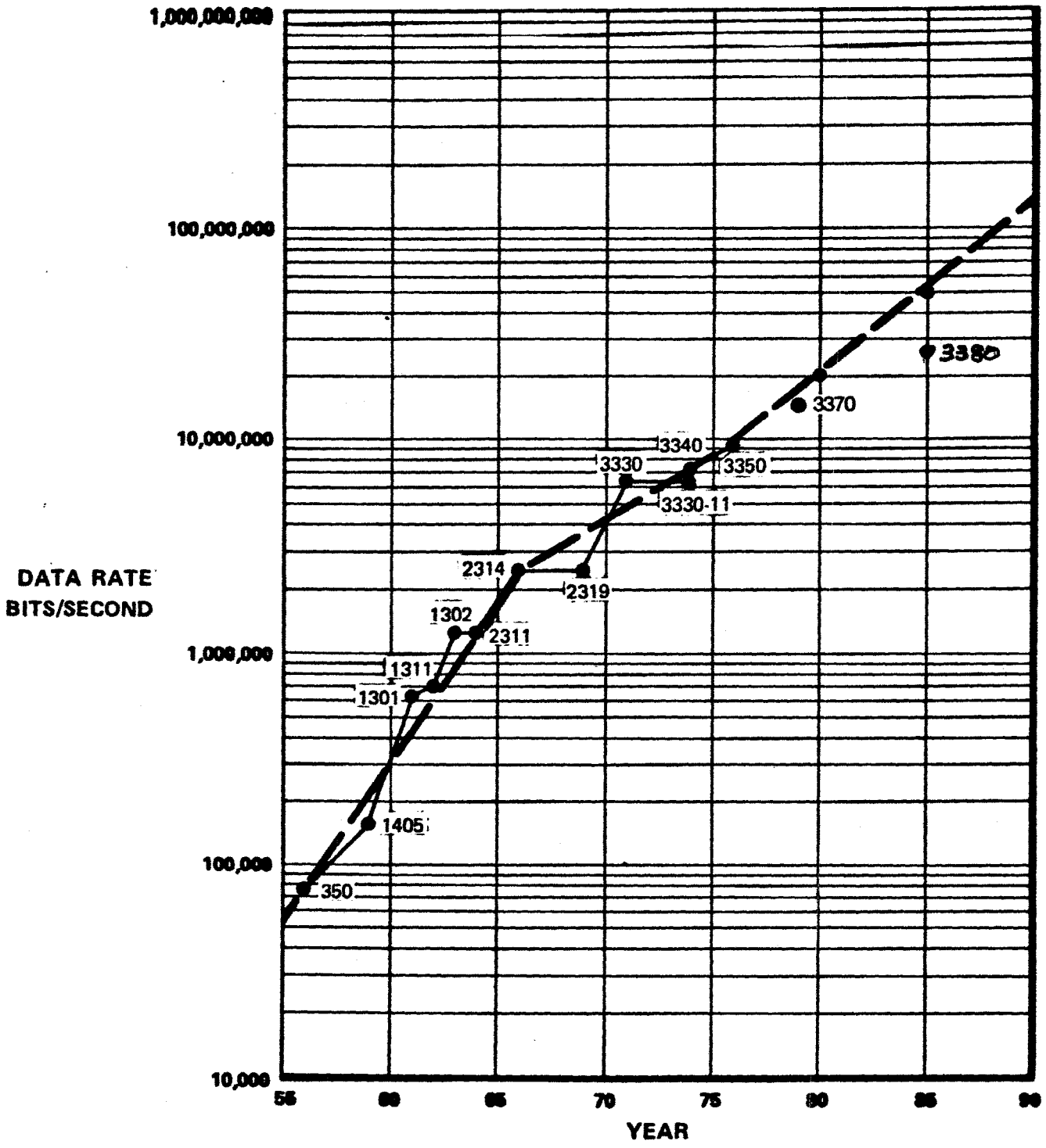

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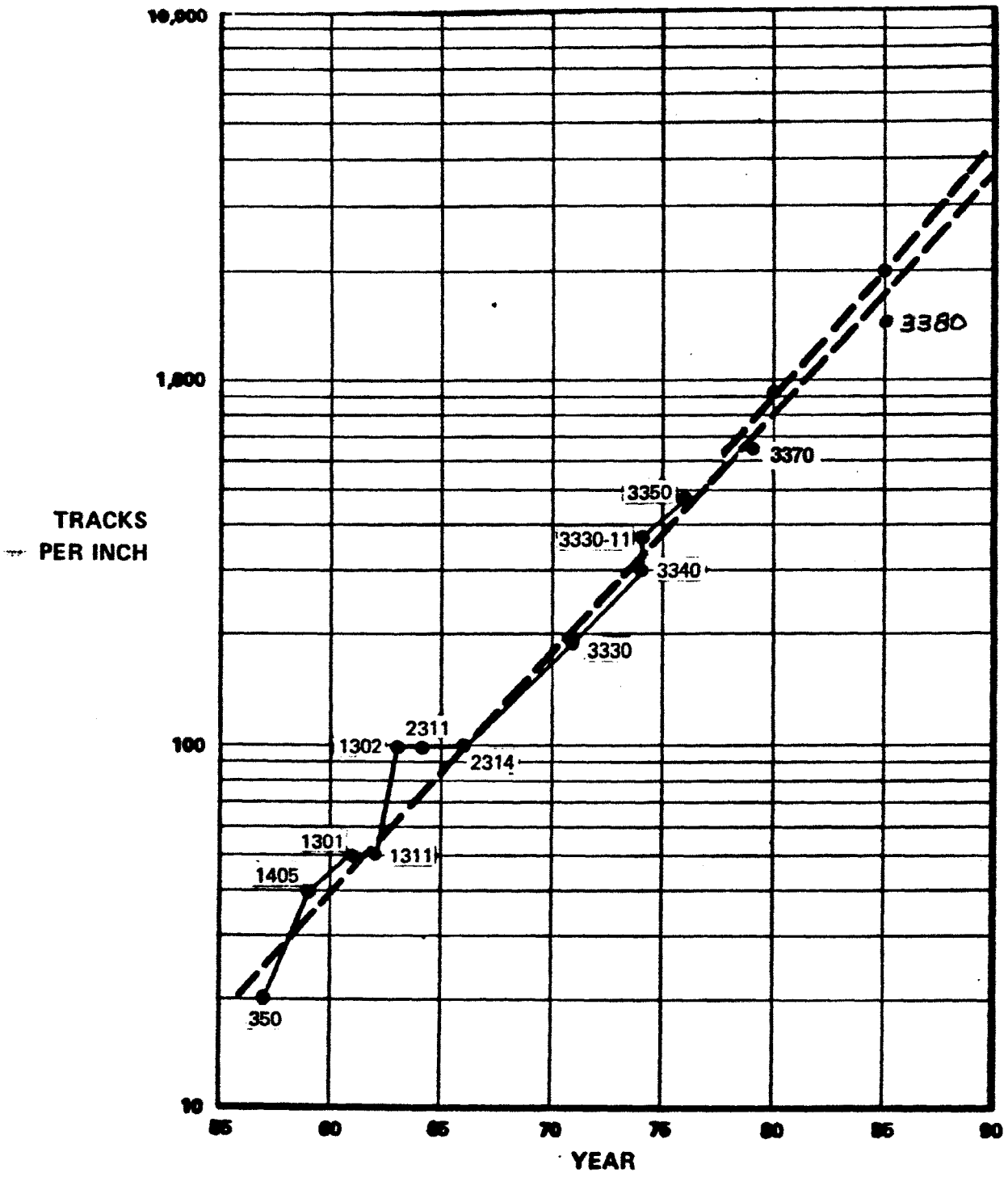

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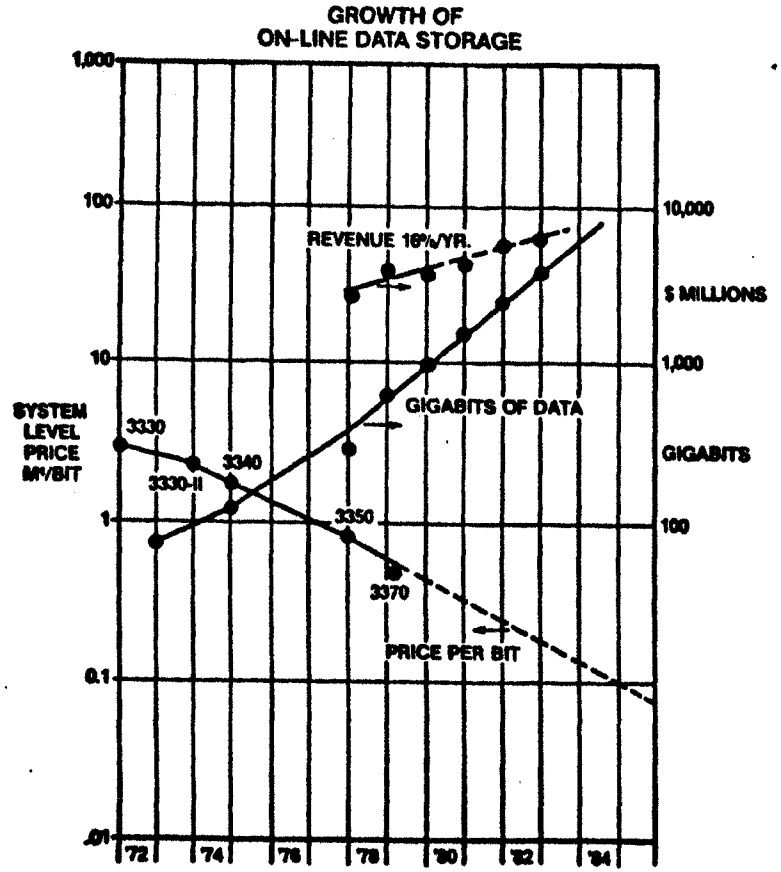

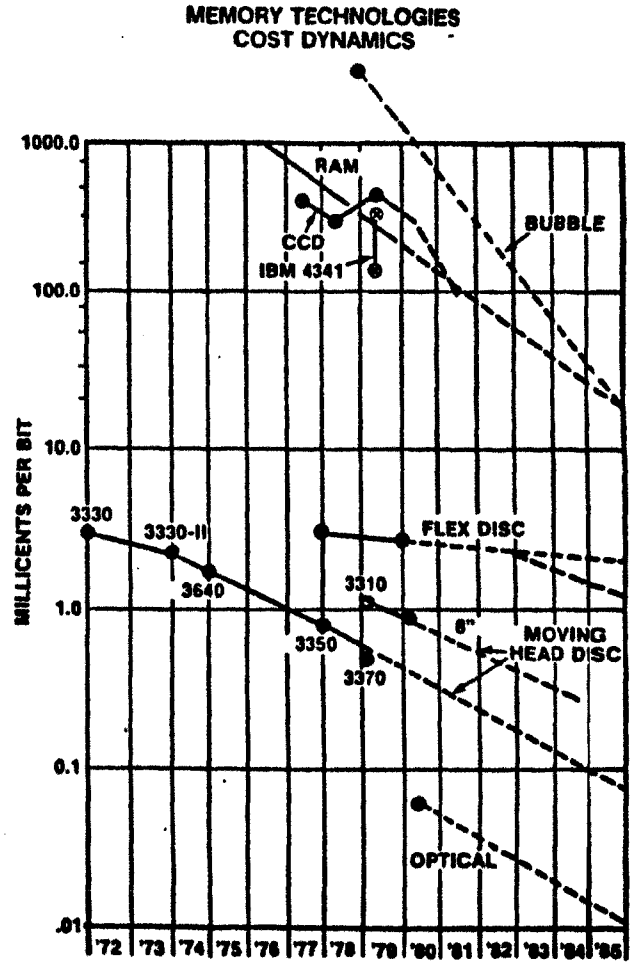

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MOVING HEAD DISC TECHNOLOGY PROJECTIONS

	TODAY	1981	1985
BITS PER INCH	6250	12500	25000+
TRACKS PER INCH	480	960	2000+
AREA DENSITY (b/in^2)	$3x10^6$	$1.02x10^7$	$5x10^7$+
AVG SEEK (ms)	20	8	4
DATA RATE (MBits/sec)	9.58	20	50
HEAD TRK WIDTH (milli-inch)	1.2m	0.7m	0.3m
COATING THICKNESS (microinch)	35	8	4
CAPACITY/SPINDLE (MByte)	317	1000	4000+
PRICE PER BIT (millicent)	0.828	0.375	0.1

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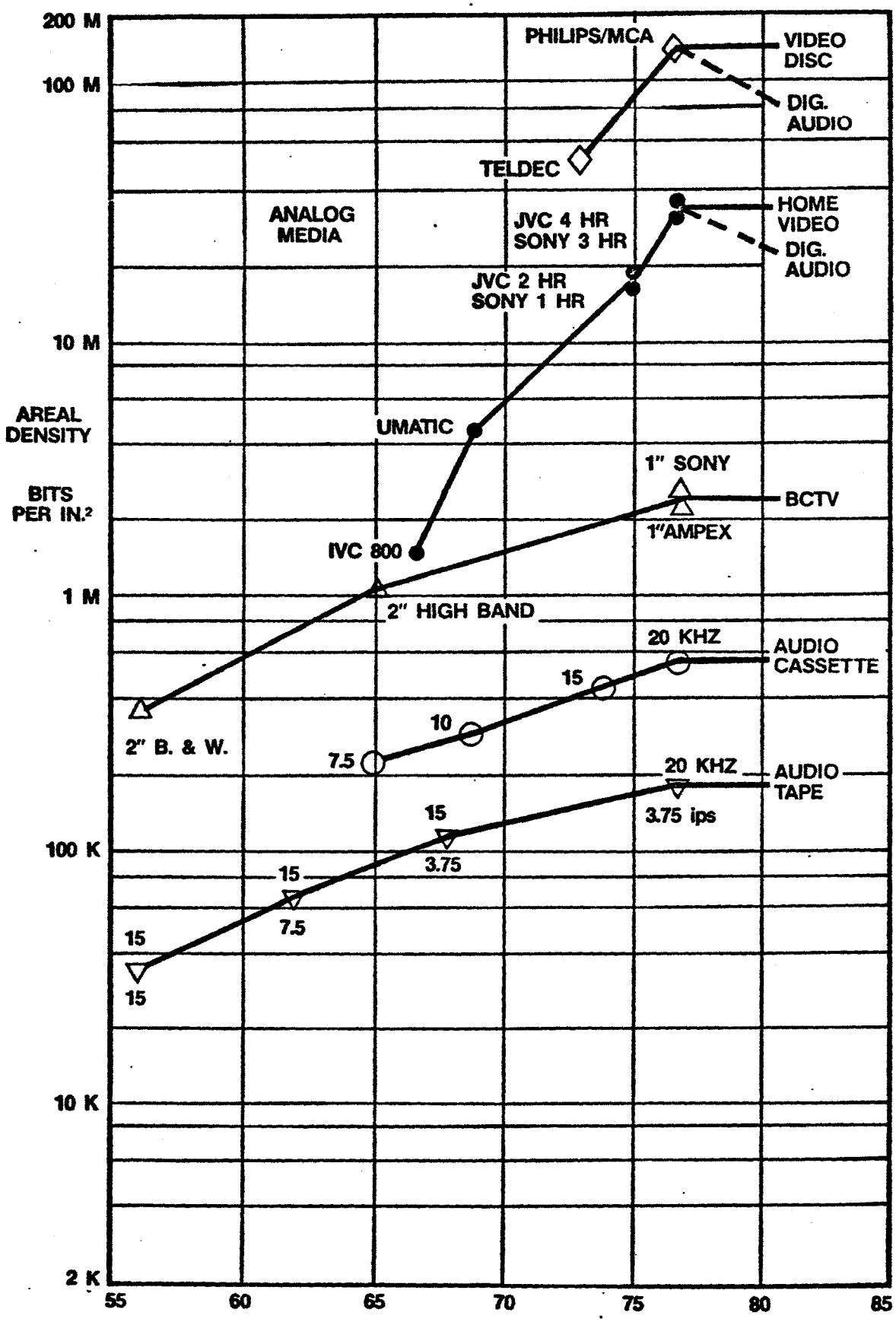

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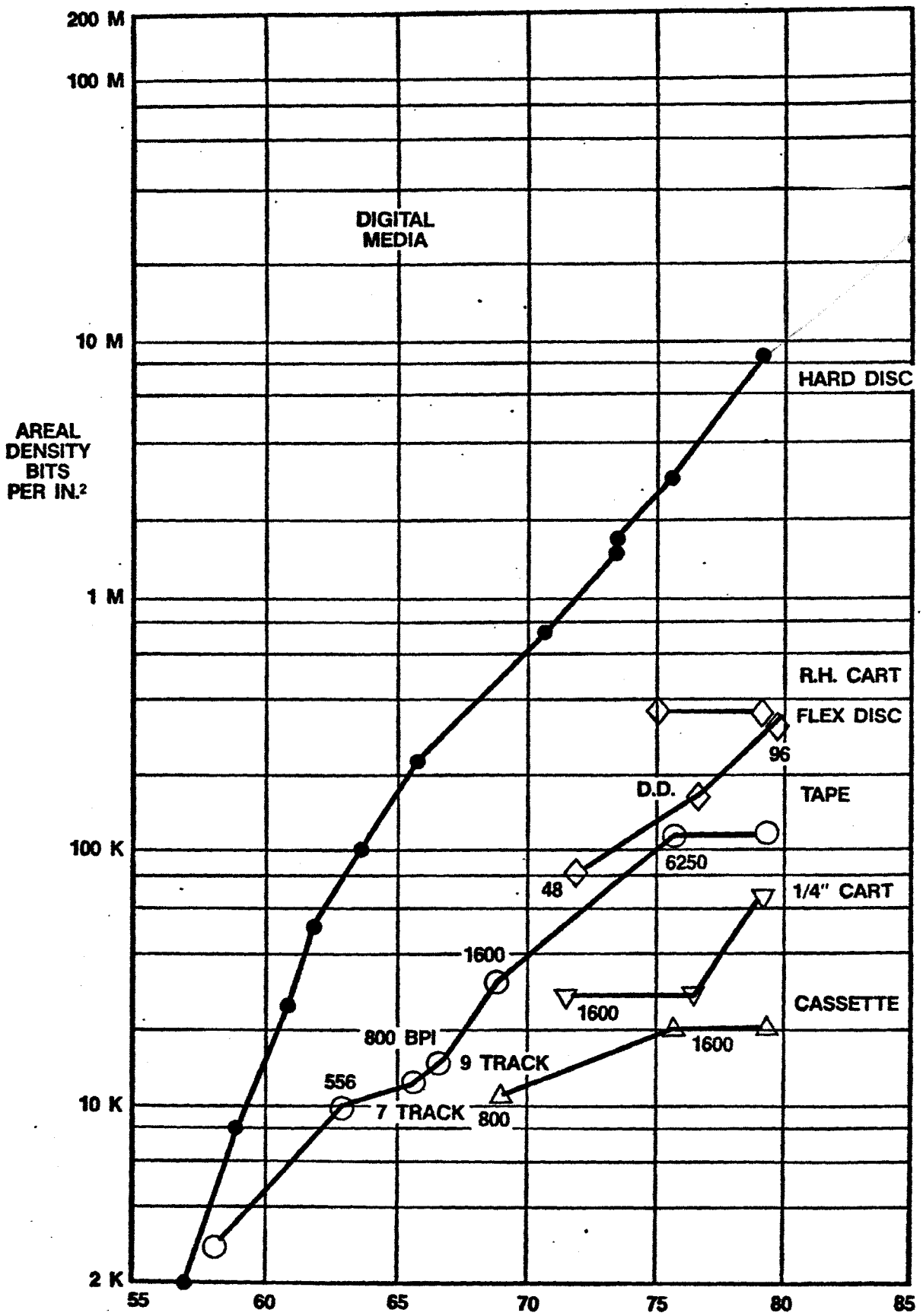

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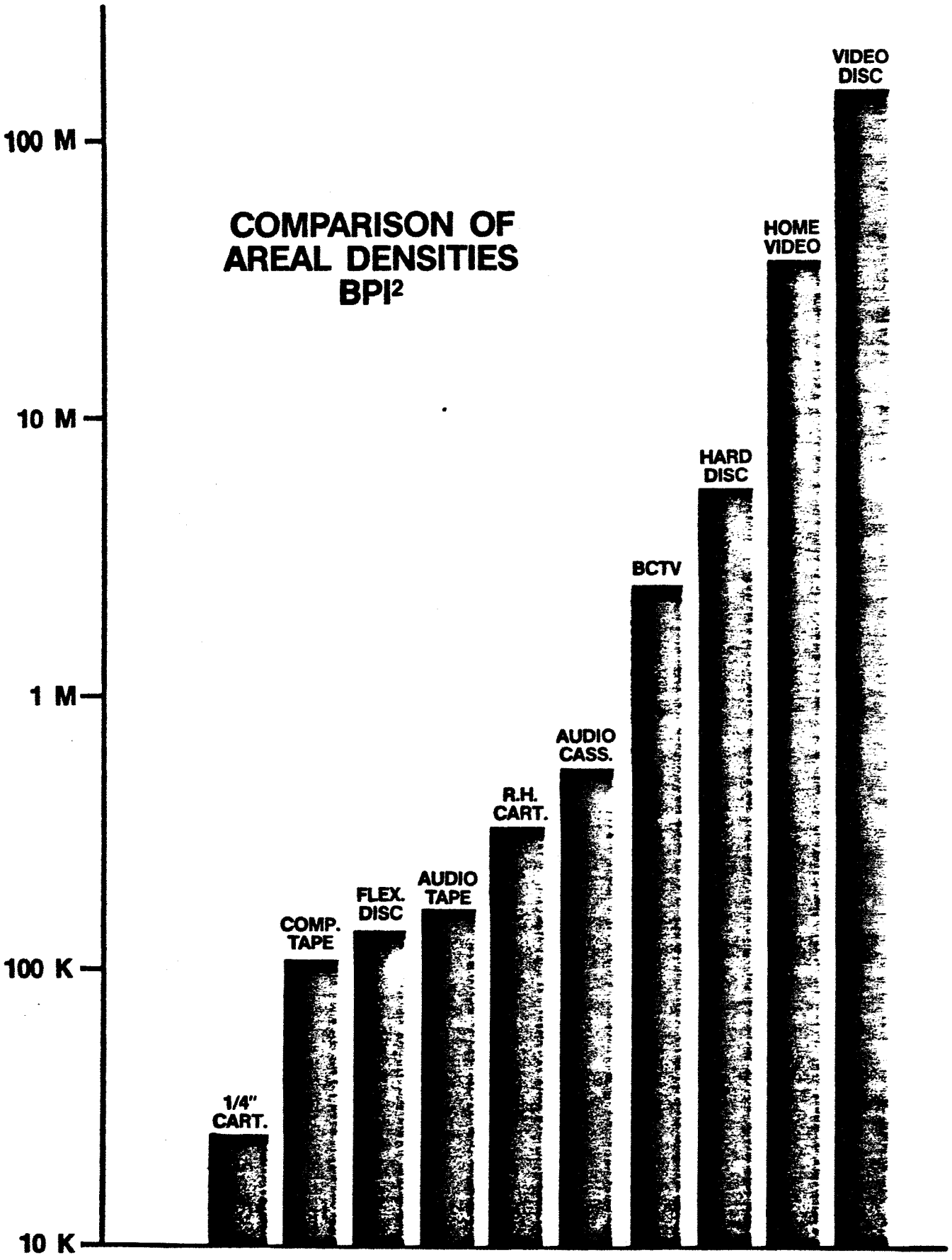

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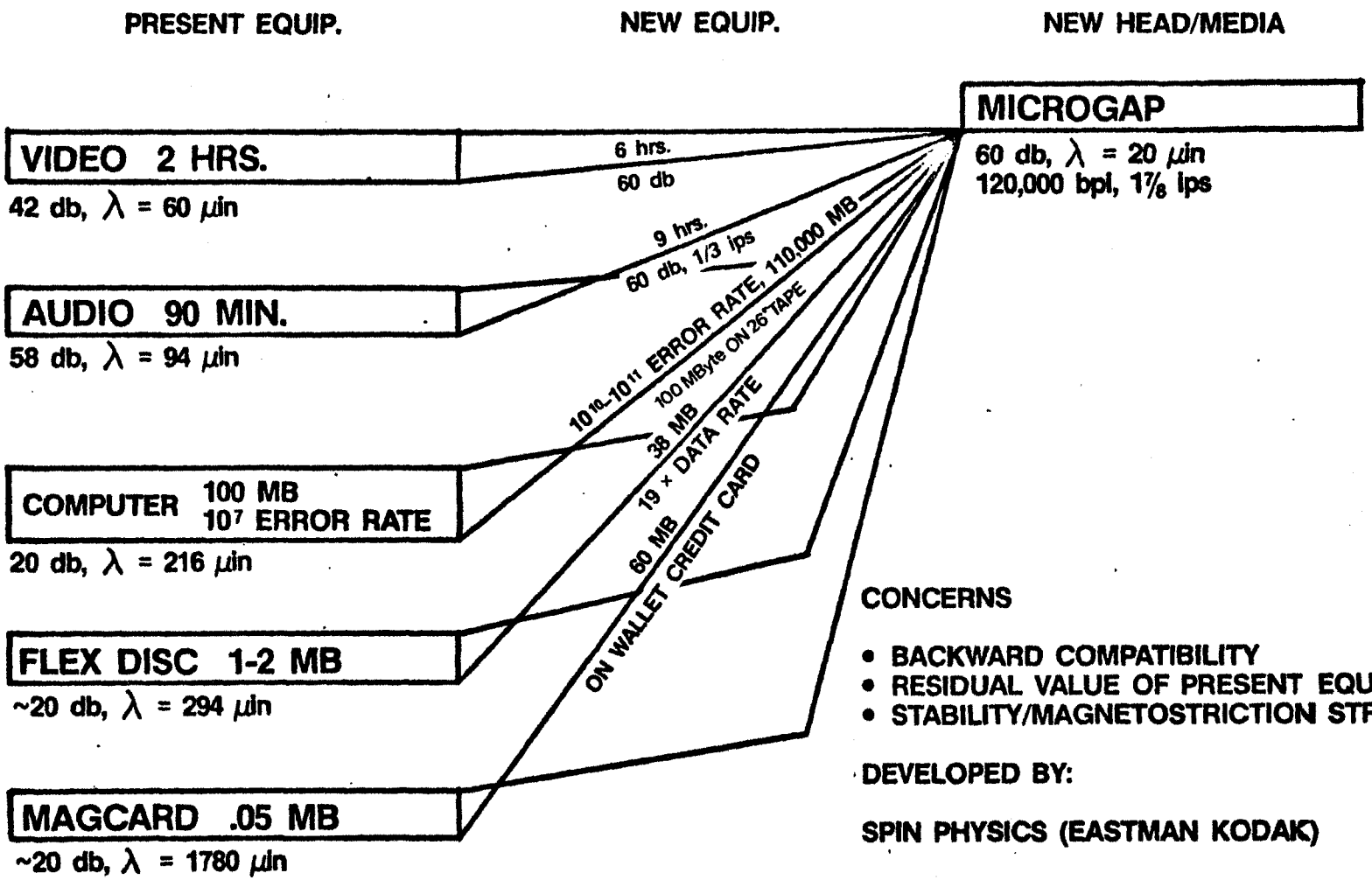
MICROGAP RECORDING



CONCERNS

- BACKWARD COMPATIBILITY
- RESIDUAL VALUE OF PRESENT EQUIPMENT
- STABILITY/MAGNETOSTRICTION STRESS

DEVELOPED BY:

SPIN PHYSICS (EASTMAN KODAK)

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