WINCHESTER BACKUP

THE HERE-AND-NOW
1¼-INCH CARTRIDGE TAPE DRIVE

PRESENTED BY DATA ELECTRONICS INC.
SAN DIEGO, CALIFORNIA
BACKGROUND

DC-300A DATA CARTRIDGE INTRODUCED BY 3-M in 1972

APPLICATIONS
- Data Logging
- Telecommunications
- Geophysical exploration
- Military

DATA ELECTRONICS, INC.

Cartridge Tape Drives
CHARACTERISTICS 1972-1976

- 1600 BPI
- 300 ft. Tape Cartridge
- 2.88 MByte Capacity
- 48 K Bit/Sec Transfer Rate

- STEADY GROWTH MARKET

- APPROXIMATELY 100,000 DRIVES IN FIELD

Applicable Standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI X3.55-1977</td>
<td>Unrecorded Cartridge</td>
</tr>
<tr>
<td>ANSI X3.56-1977</td>
<td>Recorded, serial format</td>
</tr>
<tr>
<td>dpANSI x3.72</td>
<td>Recorded, parallel format</td>
</tr>
</tbody>
</table>
NEW DEVELOPMENTS

- 6400 BPI - High Density Recording
- 450 Ft. Tape Cartridge
- 17.5 MByte Capacity
- 192 KBit/Sec Transfer Rate
RESULTS...

A PERFECT FIT FOR AN EMERGING NEW EXCITING MARKET PLACE
WINCHESTER DISK BACK-UP
Non-IBM Rigid Disk Drive Shipments

Source: Disk Trend Reports

Non-IBM Rigid Disk Drive Shipments

Source: Disk Trend Reports
Non-IBM Rigid Disk Drive Shipments

1979 & 1980 Forecast

Source: Disk Trend Reports

Projected backup requirements for non-IBM systems using fixed disk drives
Based on shipments of systems using fixed disk drives less than 200 MB

Credit: James Porter Author of Disk Trend Reports
# WINCHESTER BACK-UP

## CRITERIA
- **CAPACITY:**
- **BACKUP TIME:**
- **SIZE:**
- **ERROR RATES:**
- **COSTS:**
- **ENVIRONMENT:**
- **RELIABILITY:**
- **INTERFACE:**
- **MEDIA:**

## CHARACTERISTICS DESIRED
- **CAPACITY:** 5 - 80 MByte
- **BACKUP TIME:** 2 min. to 15 min.
- **SIZE:** Same or less than 8” Floppy
- **ERROR RATES:** Same as disk
- **COSTS:** ½ to ⅓ cost of disk
- **ENVIRONMENT:** Low-skilled operator
- **RELIABILITY:** Greater than disk
- **INTERFACE:** Simple, convenient
- **MEDIA:** Low cost, multi-sourced

Note: These were derived through independent market research.
START/STOP ¼" DRIVE

FEATURES

• True tape peripheral
• File search capability
• File management capability
• Track Addressing
• Traditional tape interface

25,000 in use
START / STOP CARTRIDGE TAPE DRIVE

• CHARACTERISTICS
  • 6400 BPI
  • 17.5 MBytes (up to 68 MBytes @ 3m/s)
  • 30 ips Read/Write
  • 90 ips Search & Rewind
  • 192 KBit/Sec Transfer rate
  • 4 Track Serial
DIRECTION OF TAPE MOVEMENT

DATA FORMAT
FOR INCREMENTAL RECORDING MODE
STREAMING ¼" CARTRIDGE TAPE DRIVE

- Faster back-up — 5 MByte/min
- Increased transfer rate
- Increased capacity
- Compressed data format
- Invisible error rates
- Size of 8" Floppy
- Simplified interface
- Lower installed cost

DATA ELECTRONICS, INC.

STREAMER
SERPENTINE RECORDED TRACK FORMAT

FORWARD DIRECTION OF TAPE

TRACK NO.  ANSI EW  ANSI LP  END OF RECORD

BEGINNING OF RECORD

EOT HOLES

BOT HOLES
STREAMING 1/4" CARTRIDGE TAPE DRIVE

- INCLUDES
  - Double buffering
  - Code conversion
  - Formatting
  - Error Detection/Correction
STREAMING ¼" CARTRIDGE TAPE DRIVE

• WHAT IS STREAMING?
  Utilization of all available tape by eliminating the traditional starting and stopping in interrecord gaps.
  A compressed data format
MINIMUM DATA TRANSFER TIMES, NOT INCLUDING REWIND

FOR 10 MB TO QUARTER-INCH CARTRIDGE DRIVES

<table>
<thead>
<tr>
<th>CONDITIONS</th>
<th>START/STOP</th>
<th>6400 BPI, 30 IPS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STREAMER</td>
<td>7816 BPI, OPTIMUM IPS</td>
</tr>
</tbody>
</table>

DATA SOURCE: Freeman Reports
TIME TO TRANSFER 10 MB TO QUARTER-INCH START/STOP TAPE DRIVE

FOR VARYING BLOCK SIZES

(ASSUMES 6400 BPI, 30 IPS (24 KBS), 450-FOOT CARTRIDGE, NO REWRITES, NON-SERPENTINE RECORDING)

MINUTES

4 TRACKS

3 TRACKS

PRACTICAL BLOCK SIZE LIMITS
1.5 KB MINIMUM
40 KB MAXIMUM

DATA SOURCE: Freeman Reports

BLOCK SIZE (KB)
To maintain streaming operation, the Streamer must transfer data at nearly 90k bytes/sec; a slower transfer rate causes the drive to start and stop repeatedly, making the process slower than a standard cartridge-based approach. A 90k bytes/sec rate implies about 11 μsec of processing time per byte. Not even the new 16-bit μPs can move data this rapidly — especially while handling handshakes and monitoring status lines — without the aid of direct-memory-access (DMA) circuitry. Additionally, the new Winchester discs are hard pressed to maintain this transfer rate while allowing for sector seeks and track-to-track head movements. Thus, only with DMA hardware can a μP hope to provide data rapidly enough for the Streamer. And the disc also needs DMA transfers in order to keep the tape streaming.

Taking these problems into account, DEI now markets a Streamer that operates at 30 ips (see box, “Two streaming-speed options”). At this speed, the disc and host have a chance of keeping up with the Streamer. As a result, even though the transfer rate is only one-third as fast, the Streamer never has to stop, thereby speeding the backup operation.

Robert Grappel, Consultant
and Jack Hemenway, Consulting Editor

EDN AUGUST 20, 1980
TIME TO TRANSFER 10 MB TO QUARTER-INCH STREAMER TAPE DRIVE

FOR VARYING TRANSMISSION LENGTHS

ASSUMES 7816 BPI, FEW REWRITES, SERPENTINE RECORDING, 300 IPS² RAMP ACCELERATION

DATA SOURCE: Freeman Reports
CURRENTLY AVAILABLE INTERFACES:

<table>
<thead>
<tr>
<th>TYPE OF DRIVE</th>
<th>Start/Stop</th>
<th>Streaming</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>u Nova, Nova, MULTIBUS</td>
<td>LSI-11</td>
</tr>
<tr>
<td></td>
<td>RS232, S-100</td>
<td>S-100</td>
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<tr>
<td></td>
<td>Pertec FT 8000</td>
<td>PDP-11</td>
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<tr>
<td></td>
<td>Ohio Scientific C2/C3</td>
<td>MULTIBUS</td>
</tr>
<tr>
<td></td>
<td>LSI-11, Q-Bus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PDP-11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TI-990</td>
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</tbody>
</table>
FUTURE TRENDS

VARIABLES

- Bit density
- Number of tracks
- Tape length
- Tape speed
- Costs

The future of this product is not at all limited by technology, but only by the creativity and capability of who designs, manufacturers, and uses 1/4-inch Cartridge Magnetic Tape Drives.