

Exatron Stringy Floppy

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Exatron Stringy Floppy

General Overview

- * The "Stringy Floppy" is a magnetic media mass storage device currently sold by Exatron Inc as a peripheral for TRS-80 and Apple computers.
- * Exatron is not affiliated with these manufacturers and does not have any special status with them
- * The Stringy is between cassette and disk systems in performance and equal to disk and digital cassette in data reliability
- * The key innovation is the media (called a wafer) which is an endless loop tape cartridge that operates like an audio 8 track cartridge. This wafer uses 1/8 inch tape and is about the size of a business card.

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General Overview - continued

- * Operation is completely automatic - there are no user controls or adjustments
- * A tradeoff is made between access time and storage capacity since longer tapes have longer "loop" times but higher storage capacity
- * Wafers are provided in lengths from 5 feet to 75 feet to give a choice of access time and storage capacity

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Performance Highlights

- * Basic tape speed is 10 inches per second
- * Transfer rate is 8000 bits per second giving a tape density of 800 bits per inch. The thin tape is relatively "rigid" under these conditions compared to more conventional tape systems
- * The loop times and storage densities for the common wafer lengths are:
 - 5 feet 6 seconds 4 KBYTES
 - 10 feet 12 seconds 8 KBYTES
 - 20 feet 24 seconds 16 KBYTES
 - 35 feet 42 seconds 30 KBYTES
 - 50 feet 60 seconds 42 KBYTES

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Performance Highlights - continued

- * Data error rates are specified at one error in 10 to the 9th for soft errors and one in 10 to the 11th for hard errors
- * Media life is specified at 250 hours or 40,000 passes, whichever comes first. Tapes shorter than 20 feet will reach the 40,000 passes first, longer ones will reach 250 hours first. For reference, floppy diskettes are generally specified at 200 hours media life.
- * The only moving part in the drive is the drive motor which is the dominant factor in drive MTBF. Current motors used by Exatron are specified by the manufacturer to have 800 hour MTBF. Based on our estimate of 20 to 30 motor on hours per year in typical use, this would result in less than 1% annual return rate. We are investigating new motor sources that can potentially increase this MTBF.

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Mechanical Description

- * Drive consists of two piece housings
 - Bottom housing provides mounting for the drive motor and head
 - Top housing provides mounting for two flat springs (to index the wafer) and two opto detectors (for beginnings of tare and write protect)
- * The drive motor shaft is the camstan and no belts or idlers are required
- * The wafer contains the pinch roller
- * Write protect is provided by placing a white summed dot over a black area of the wafer
- * Beginning of tare is sensed by reflection from the splice which is aluminized

Mechanical Description - continued

- * The tape head has an integral tape guide to assure tape alignment
- * Two screws are required to hold and align the tape head
- * Drive dimensions (TI version):
 - Width
 - Depth
 - Height

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Detail Specifications

- * Do we need this foil?
- * Power consumption?

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Role in Advanced Language Calculator Strategies

- * Key factor in creating a software base is reliable fast media for program storage and retrieval
- * Solid State Software capability will be retained on ALC products, but applications are limited somewhat by development time and ROM mask costs
- * Audio cassette interfaces are used by most of our competition and give us an excellent competitive opportunity
 - Audio cassette interfaces typically cost \$40-\$50 at retail
 - A suitable audio cassette recorder costs \$40-\$80 with higher prices for the more portable or more reliable units
 - Audio cassette operation involves use of confusing manual controls

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* (Audio cassette problems - continued)

- Audio cassette operation limited to 300 baud to achieve marginally acceptable error rate (error rate heavily dependant on quality of recorder, conditions of use, operator patience in setting volume control, etc.)
- Most audio recorders are relatively large for the portable applications important for ALC products

* A \$125 mass storage device which is small, has no user controls, is more than an order of magnitude faster, has floppy disk data integrity and small convenient media should stand out exceptionally well in the current marketplace as a desirable approach for both users and software developers

- * The only other approach potentially vying for a dominant position in this portable mass storage market is the micro cassette
 - Same media as used in portable dictation machines
 - Drive complexity is substantial - solenoid operated rewind, fast forward, play and record. Idlers and clutches required for maintaining tape tension ,etc.
 - Used in Sony Tycorder, Epson HC-20
 - Data rate generally about half of stringy floppy rate
 - Data capacity is 100 KBYTES to 200 KBYTES but so far there are no "short" tapes available to trade off capacity and access time

Role in Advanced Language Calculator Strategy - continued

- * In the ALC strategy, the predominant use of the mass storage device will be program storage and for average length programs (4 to 8 KBYTES) the program SAVE and LOAD times will be about 6 to 15 seconds and will be comparable to (in some cases less than) floppy disk operation
- * However, due to the simple operating mode and high data density, the Stringy Floppy will also provide reasonable operation for data storage with undatable file structure. Each wafer can contain a directory and data can be stored with filenames, extensions and passwords just like a floppy disk

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Exatron Business Summary

- * Exatron is a small company with about \$2.5 million in annual sales
- * Company operates in 8,000 SF of rental space in Sunnyvale, CA
- * First business was semiconductor test equipment, still a bit over half of annual sales. Stringy product introduced in 1978.
- * Initially, drives and wafers were purchased from the company which originally developed the system in the early 1970's - Micro Communications Corporation
- * Product was originally developed as a small audio "spot announcement" deck for radio stations
- * Exatron bought all rights and tooling from Micro Communications in 1980

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Exatron Business Summary - continued

- * Exatron currently is the sole supplier of drives and wafers
- * Most of the detailed technical knowledge of the system resides with K. Rey Smith, who has been a consultant to Exatron. He was previously associated with Micro Communications and Exatron is in the process of renewing his consultation agreement with them
- * Exatron is controlled by Robert L. Howell, who is interested in improving his company's cash flow by attracting a minority interest position by an outside investor

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Exposed Contract

- * The main objectives for TI in acquiring the Stringy technology are:
 - Protect TI from disruption if Exatron were to go out of business
 - Obtain complete manufacturing rights to the drive and wafer (since the drive is mostly material and almost negligible labor it is key TI be able to build it and avoid paying second margins on the material content)
 - Commit Exatron to complete technical support during our development effort
 - Obtain Exatron's concurrence and support in identifying and qualifying a quality second source for wafers

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Proposed Contract - continued

* The present draft contract provides:

- Perpetual, worldwide nonexclusive rights with rights to sublicense except that bare drive sales to other OEM's would require a royalty payment of 5% of selling price
- All technical data on present products with enhancements and new developments through January 1, 1984
- Exatron will not sell or offer to sell these products to an OEM computer or word processing system manufacturer prior to January 1, 1983
- Exatron will provide a suitable contract with K. Rev Smith to insure his technical assistance through the period ending January 1, 1983 and will include 200 hours of consulting as part of our payment with further consulting on a fee basis if required

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Proposed Contract - continued

- TI will pay a single fee for these rights of \$200K
 - ...One sixth (33K) on receipt of technical data
 - ...One sixth (33K) on release of tooling by TI
 - ...One sixth (33K) on successful first article inspection of drive parts
 - ...One half (100K) prior to introduction of a TI product using the drive
- Payments may be avoided entirely if the milestone is abandoned

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CEG_Must_Does

Complete patent search and contract approval by legal	20 Nov 81
review business plan with Kirk Pond and Bill Sick	27 Nov 81
Present contract for approval to CDC	16 Dec 81
Review technical data with Exatron	21 Dec 81
Release tooling	Feb 82
Identify wafer source	Mar 82
Drive qualification	Jul-Sep 82

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