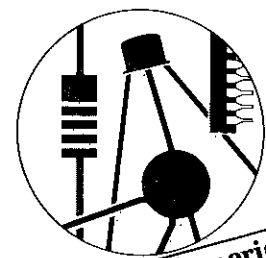


The 3" vs. 3 1/2" Minifloppy Battle

By Leslie Solomon
Technical Director

The latest trend in miniaturization has produced two new types of disks battling it out between themselves and perhaps the established larger floppies

A MAJOR trend in computer technology today is toward size reduction. Digital computers were once behemoths that occupied large rooms. They gave way, however, to minis that could be rack-mounted or placed on a large desktop. Then came the microcomputer, producing another order of size reduction. The past couple of years has seen still another size reduction with the introduction of the battery-powered "pocket" or "handheld" computer that can be carried in an ordinary briefcase or



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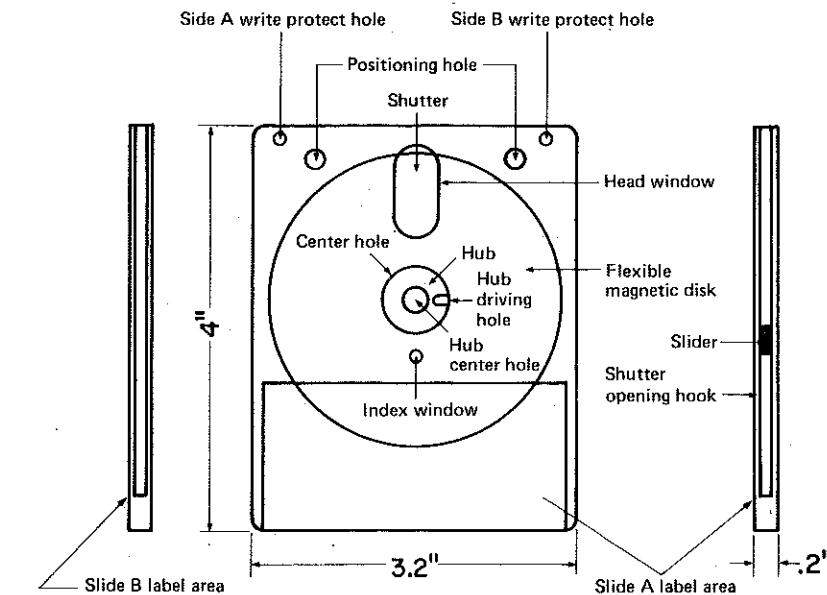
even stored in one's jacket pocket.

In line with computer size reduction, data storage devices have also undergone great dimensional changes. Large magnetic drums were once used to store data, but the introduction of the low-cost microcomputer led to the development of reasonably priced, relatively small 5¼" and 8" floppy-disk systems so common today.

Of course, data expands to fill the available storage media, so new approaches were found to increase the amount of data that could be stored on popular disks. From the original single-density modulation technique that allowed about 90K bytes on a diskette, came double-density that allowed twice the amount of data to be stored. Some manufacturers have even started to produce quad-density diskettes. There is still no standard for these techniques, however. Today, one can get about 300K bytes on a 5¼" and approach one megabyte on an 8" diskette.

Since physical size is important to the creation of small computers, drive manufacturers started to deliver slender mechanisms (still using the 5¼" and 8" diskettes), giving birth to low-profile packages that are coordinated with the sleek look of a modern computer enclosure.

Now we are on the verge of a new generation—the "3-inch" floppy



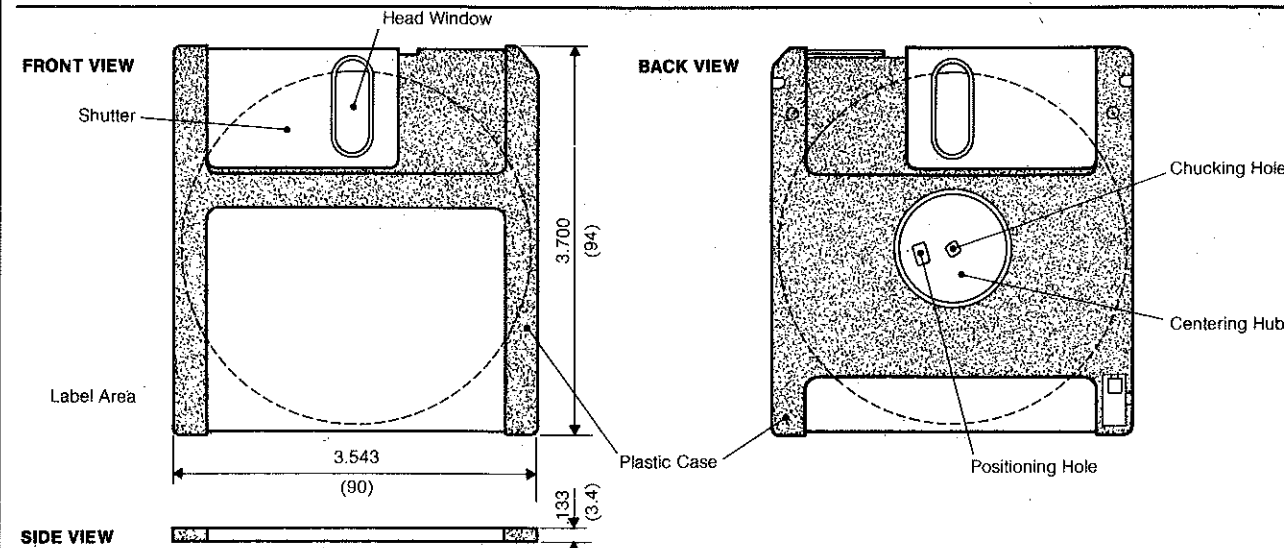
Construction of the Hitachi 3" Compact Floppy Disk

diskette system that not only offers a great size reduction, but an even greater storage density. Although designated a floppy diskette, only the internal media is floppy since the diskette is housed in a rigid enclosure. Currently, there are two major small-disk competitors: the 3-inch Compact Floppy Disk (CFD) developed jointly by Hitachi Ltd., Matsushita Electric Industrial, Hitachi Maxell, Ltd., and TDK Electronics Corp. versus the Sony 3.5-inch Micro Floppydisk.

Although many manufacturers, including Dysan, Shugart, Verbatim, Tabor, Xidex, Olivetti, Brown Disc Mfg., Micro Peripherals Inc.,

and BASF are having meetings to determine the specifications for the new small diskette, no standards have been set as of this writing. The standards group will first concentrate on the packaging—soft or hard jacket—then will cover the media's magnetic characteristics. It will present its findings at an upcoming fall meeting of the American National Standards Institute (ANSI).

However, several computer manufacturers are jumping on one bandwagon or the other. Amdek, Brown Disk, and Otrona, for example, are leaning toward the Hitachi approach, while Jonos Ltd. and



Physical parameters of the Sony Micro Floppy Disk.

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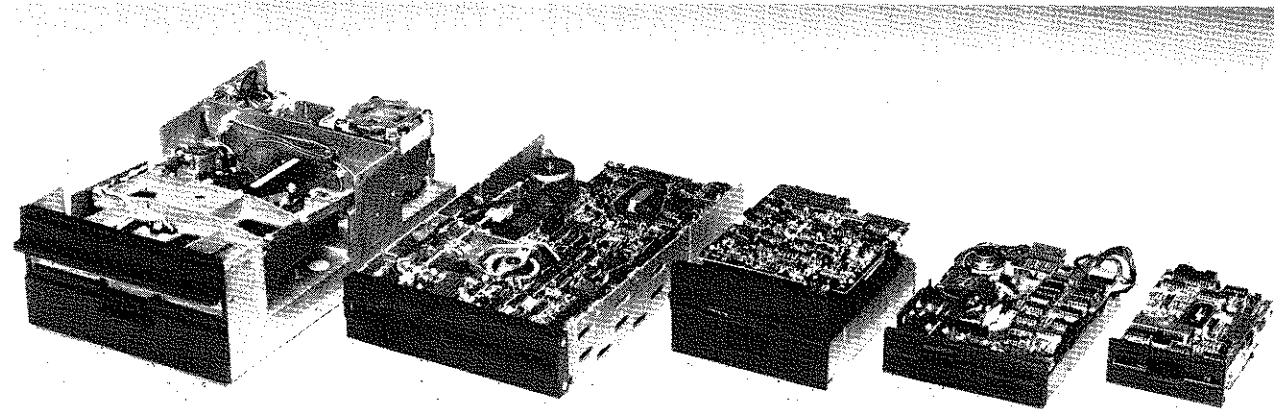
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The shrinking world of disk drives is shown by a conventional 8" at left, followed by a half-size 8", conventional and half-size 5¼", and 3½" drive at far right.

Hewlett-Packard, among others, have elected to go the Sony route. The parameters of both types of diskette are shown in the diagrams on the preceding page.

Physically, the approaches are very similar, although the diskettes are not interchangeable. Each is about half the size of a conventional 8" diskette and about 60% the size of a 5¼" unit. In both cases, the recording media has a rigid case that provides mechanical protection, and each has a sliding shield that automatically covers the head hole when the diskette is removed from the drive. Each is also provided with a solid rim that surrounds the

drive hub hole to prevent diskette warping when the drive is engaged to the soft recording media.

The major difference shows up in track density and rotational speed. Sony's new head allows 135 tracks per inch with a data track width of 125 microns and a guard band of 63 microns. The gap length of the read/write head is 2 microns while rotational speed is 600 rpm. The Hitachi approach uses 100 tracks per inch. To allow its microdisk to gain acceptance, the rotational speed (300 rpm), data transfer rate, recording capacity per track, and other specifications are essentially the same as conventional 5¼" sys-

tems. The diskette magnetic coating has the same recording capacity as a double-density 5¼", making it possible to transmit data from a 5¼" disk to the 3" microdisk using a similar controller. Specifications for both approaches are shown in the Table.

There is no question that the small diskette will be improved to give higher densities and capacities. The development of perpendicular recording, where the magnetic domains run *through* the magnetic media, rather than *along* the media as conventionally used, could produce a considerable increase in data storage. It is quite possible at this time to produce microdiskettes having one-megabyte storage using the double-sided version, increasing the storage density to possibly 100 megabytes.

Drives. As the diskette size dropped, so did the physical dimensions of the drives. However, the apparent size drop in this area is greater than the difference between the diskettes themselves. Although the microfloppy diskette is about 60% of the size of a conventional 5¼" diskette, the floppy disk drive volume appears to be about 75% smaller than the 5¼" drives. This is important when designing systems for small computers since more data storage can be packed into the same valuable space.

The Sony OA-D30V drive is 4" W × 2" H × 5" D. The Hitachi

HFD 305S is 3½" W × 1½" H × 6" D. Both of these are single drives. Amdek Corp., is producing a dual-drive package called the Micro-Floppydisk for the 3" diskette whose dimensions are a mere 7" W × 4" H × 8" D. TDK is currently talking to Shugart about the 3" (Hitachi) and say that they will talk to any drive manufacturer that displays an interest in the new small disk.

Tandon who is looking into the Sony approach, uses a double-sided diskette that can support 875K bytes, and a drive that is only 1½" H × 4" W × 6½" D.

Winchester Drives. Not only are floppy diskettes and their drives getting smaller, hard disks are also on the way down. Sony is soon to introduce its 3½" hard disk that will offer 3 to 10 megabytes using conventional recording, increasing to 10 to 100 megabytes using perpendicular recording. They also claim to have removable media under consideration.

The SyQuest SQ306 is a 3.9-inch Winchester disk drive with removable cartridge media. Unformatted, this disk has a 6.38-megabyte capacity, with 5-megabytes formatted. Its half-height form factor, just 1.625 inches high, allows two of these drives to be located in the same physical space as a single 5¼" drive. It is fully compatible with the Seagate ST506/406 5¼" fixed Winchester drive, and uses the controllers designed for the ST506/406 such as the DTC, 510A, XEBEX 1410, and the Western Digital WD 1000. The removable cartridge media requires no purge cycle upon power up and is engineered for 10,000 insert/removal operations. Price of a disk pack is less than \$30 in OEM quantities.

The SyQuest features a fully digital closed-loop embedded servo that extends the accuracy of the metal-band positioner to 100 microinches. The embedded burst servo, where the control data resides within a single wedge per track, allows full definition control of sector formats. An on-board microprocessor verifies track position after each seek and adjusts for any positioning errors.

DISK SPECIFICATIONS

	SONY		HITACHI	
	Single density	Double density	Single density	Double density
Capacity				
Unformatted (K bytes)	218.8	437.5	250	500
Formatted (K bytes)				
Sectors/track	9	9	16	9
Per disk	161.2	322.5	164	184
Per track	2.3	4.6	2.048	2.304
Per sector	256	512	256	512
Transfer Rate (K bits/s)	250	500	125	250
Latency (avg in ms)	50	50	100	100
Access time (ms)				
Track to track	15	15	3	3
Average	365	365	55	55
Settling time	15	15	15	15
Head load time	50	50	NA	NA
Rotational Speed (rpm)	600	600	300	300
Recording Density (bpi)	3805	7610	4473	8946
Track Density (tpi)	135	135	100	100
Encoding Method	FM	MFM	FM	MFM
Tracks per side	70	70	40	80

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