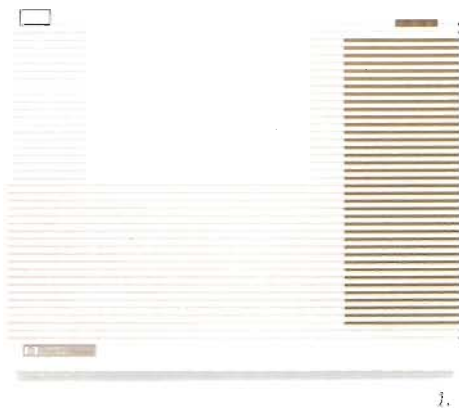


HEWLETT-PACKARD

HP 7936 and HP 7937

Thin Film Technology Disc Drives





Compact size coupled with high density data format make the HP 7936 and the HP 7937 Disc Drives ideal data storage for a wide range of multi-user computer systems. The HP 7936 and HP 7937 are easily matched to HP 3000, HP 1000, and the HP 9000 computers. High data density storage is pro-

vided by state-of-the-art thin film magnetic media. Seven eight-inch platters in the HP 7937 provide 571 megabytes of formatted data storage, while four platters provide 307 megabytes in the HP 7936. These data capacities provide the lowest per-megabyte storage cost in the HP line-up of disc drives.

Features:

- 571 megabytes (formatted); HP 7937
- 307 megabytes (formatted); HP 7936
- 2.35 megabytes/second internal burst data transfer rate
- 20.5 ms average seek time
- high reliability
- compact size
- low power consumption
- wide environmental tolerance
- choice of controllers

Compact Size

The physical size of the HP 7936 and HP 7937 disc drives allows two drives to be vertically stacked in a cabinet. This optimizes floor space utilization, allowing the addition of more equipment to the data center. The modular design offers increased flexibility in rack mount and cabinet configuration.

Since power consumption is low, the installation of multiple units has minimal impact on data center air conditioning requirements. Low power consumption and a wide tolerance for ambient conditions make the disc drives suitable for installation in a variety of environments, including the factory floor, the data center, and the typical business environment.





Performance

A sophisticated dual servo system in each drive provides fast head positioning with the precise accuracy required by high track densities. One servo system controls major arm movement across the disc surface while the second positions the head precisely on track center. This type of mechanical control system not only provides a high degree of data integrity, but also improves reliability by making the drive less susceptible to the effects of environmental stress.

To take full advantage of the high bit density available through the use of thin film storage media, VLFM (variable length frequency modulation) coding is used. Precise mechanical control and high bit densities allow the HP 7936 and HP 7937 to seek at an average access time of 20.5 ms, and transfer data at burst rates of up to 2.35 megabytes per second while maintaining complete data integrity.

Thin Film Media

Sputtered thin film media from Hewlett-Packard was first introduced in 1984 in the 10 megabyte 97501

"Nighthawk" disc drive. This introduction was followed in 1985 with a 20 megabyte version. Over 40,000 of these drives are in use and have proven superior reliability and ruggedness.

The HP 7936 and HP 7937 have been expertly developed using these prior product successes as their foundation.

Tightly controlled semi-conductor sputtering technology is used to manufacture the thin film media used in the HP 7936 and HP 7937. This manufacturing method provides an extremely smooth surface

and superior magnetic qualities. This type of surface allows the read/write heads to fly extremely low. High track density is achieved with a smaller head size and precise head position control. The overall result is high capacity with increased performance and low cost.

To produce the thin film media used in the HP 7936 and HP 7937, Hewlett-Packard custom designed a computer controlled sputter deposition system. The system, the largest ever employed by Hewlett-Packard, maintains the discs in a precisely controlled, high vacuum environment throughout the thin film process. The high level of

cleanliness and process control achieved during this process ensures that each disc provides the highest in data integrity, and operates reliably for the life of the unit.

Controllers

Each disc drive includes a controller that best fits system requirements. HP-IB forms the foundation for current controllers. Utilizing the intelligent protocols of the CS/80 instruction set and standard cabling, these controllers meet the demands of most system applications.

The cache controller contains two megabytes of RAM for read cache, plus a single transaction, non-volatile write cache. Read and write cache provide high speed response without the overhead of mechanical movements. Read cache maintains a copy of frequently

requested data in RAM to reduce average read access time. Write cache gives an immediate response to the CPU after a write operation, then writes data to the disc during mechanism idle times.



3.



1. Close-up of modular design; 2. Extremely smooth surface of thin film media; 3. New sputter unit maximizes floor space utilization; 4. Internal view of head assembly; 5. Hewlett-Packard clean production facilities assures quality and reliability.



Operating specifications

	"XP"	"H"
Access time		
Average controller overhead time:	1.2 ms	<1.0 ms
Average seek time:	20.5 ms	20.5 ms
Average rotational delay:	8.3 ms	8.3 ms
Average time to transfer 1 kbyte (at 1 megabyte per second over HP-IB):	1.0 ms	1.0 ms
Controller cache impact:	-15.9 ms*	0.0 ms*
Total average transaction time (excluding system overhead):	15.1 ms	30.8 ms
Rotation speed:	3600rpm	3600rpm
Disc performance index:	66.2**	32.5**

*The reduction in time is due to the reduced number of seeks required for a drive with controller cache. The actual performance improvement on a drive will vary, depending on the timing of I/O's and the specific environment. The listed values are based on maximum I/O rates with a read hit rate of 70 percent and a read percentage of 70 to 75 percent.

**Maximum average disc transactions per second, for 1 kbyte transfers, less system overhead. Refers to fundamental disc performance: true I/O rates are application dependent and must take into account system overhead, the individual system configuration specifications and data locality on the disc. The timing of I/O's will also have a significant impact on performance of the "XP" drives.

Data transfer rate

Instantaneous: 2.35 megabytes per second

Recording density

Bits per inch (maximum): 18.8K
Tracks per inch: 1121

Operating characteristics

Capacity (formatted)

Per sector: 256 bytes
Per track: 31.5 kbytes
Total: 571 megabytes (HP 7937)
307 megabytes (HP 7936)

Sectors per track: 123
Tracks per data surface: 1396
Number of data heads: 13 (HP 7937)
7 (HP 7936)
Number of discs: 7 (HP 7937)
4 (HP 7936)

Reliability

Mean time to repair: 30 minutes
Service life: 10 years

Overall characteristics

Heat dissipation (typical): 320 watts (1092 Btu/hr)

Electromagnetic emissions

Radiated and conducted interference:

- HP 7936 and HP 7937 — For U.S.A., designed to meet FCC docket 20780 for Class A computing peripheral devices.
- HP 7936 and HP 7937 — For Europe, designed to meet EMI level FTZ 1046/84 and provide a Manufacturer's Declaration. Refer to your local Hewlett-Packard sales representative for more information.

Safety

The HP 7936 and HP 7937 disc drives meet all applicable safety standards of the following:

- IEC 380 and 435
- UL 114 and 478
- CSA C22.2 No. 154 and 143

Power requirements

Voltage range*

	Current	
	48 Hz - 52 Hz	58 Hz - 62 Hz
100V	4.4A	4.0A
120V	3.7A	3.5A
200V	2.1A	2.1A
208V	2.1A	2.1A
220V	2.0A	2.0A
240V	1.9A	2.0A

* All voltages $\pm 10\%$

Physical characteristics

Dimensions

Height: 272 mm (10.69 inches)
Width: 324.2 mm (12.76 inches)
Depth: 741 mm (29.16 inches)
Weight: 56.7 kg (125 lb)

Environmental requirements

Refer to *Site Environmental Requirements for Disc/Tape Drives Manual*, HP part no. 5955-3456, for more environmental requirements.

Ordering information

Disc drive products

HP 7937H - 571 megabyte fixed disc drive with HP-IB controller
HP 7937XP - 571 megabyte fixed disc drive with HP-IB controller cache
HP 7936H - 307 megabyte fixed disc drive with HP-IB controller
HP 7936XP - 307 megabyte fixed disc drive with HP-IB controller cache
(Cabinets must be ordered separately from disc drives.)

Available options

015 - 50 Hz operation
017 - 200, 208, 220, 240 VAC operation
Std - 60 Hz, 100-120 VAC operation

Cabinets/Accessories

HP 19511A - Two-drive cabinet for HP 7936/37 disc drives. Includes rack slides and filler panels.
Available options:
208 - Convenience receptacle/power tap for 60 Hz, 208V operation.
HP 19512A - Adapter kit for mounting HP 7936/37 disc drives in 19-inch EIA cabinet.

Upgrade kits

HP 97520XP - Controller cache field upgrade kit for HP 7936 and HP 7937 disc drives.

For assistance call the HP regional office nearest you: (Eastern) Hewlett-Packard, 4 Choke Cherry Road, Rockville, MD 20850, 301/258-2000; (Midwest) Hewlett-Packard, 5201 Tollview Drive, Rolling Meadows, IL, 60008, 312/255-9800; (Western) Hewlett-Packard, 5161 Lankershim Boulevard, North Hollywood, CA, 91601, 818/505-5600; (Southern) Hewlett-Packard, 2000 South Park Place, Atlanta, GA, 30339, 404/955-1500; (Canada) Hewlett-Packard Canada Ltd., 6877 Goreway Drive, Mississauga, Ontario, L4V 1M8, 416/678-9430; (Europe) Hewlett-Packard S.A., 150 Route du Nant-d'Avril, P.O. Box CH-1217 MEYRIN 2, Geneva, Switzerland, 011/41 22 838-111; (Japan) Yokogawa-Hewlett-Packard Ltd., 29-21 Takaido-Higashi 3-chome, Suginami-ku, Tokyo, 168, 03/331-6111; (Far East) Hewlett-Packard Asia Headquarters, 47F China Resources Building, 26 Harbour Road, Wanchai, Hong Kong, 5/833-0833; elsewhere in the world: Hewlett-Packard Intercontinental, 3495 Deer Creek Road, Palo Alto, CA, 94304, U.S.A. 415/857-1501.

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