

Microdata OEM Peripherals Cartridge Disc Drives



MarathonTM

- 2.5, 5, or 10 megabyte storage capacity
- Industry compatible interfaces
- Compact packaging — 8.75 inches high including power supply
- Modular electronics and fewer moving parts for reliability and maintainability
- Voice coil positioning system with optical position scale and velocity transducer
- Positive positioning accuracy for cartridge interchangeability between drives
- Positive air filtration (0.3-micron)
- 1500 or 2400 rpm disc rotation
- 100 or 200 tpi track density
- Daisychain capability — up to four drives per controller
- 5000-hour MTBF
- MTTR — 0.5 hour maximum
- Average access time — 35 milliseconds
- Low data error rate — less than 1 in 10¹²

2 YRS

MARATH-OEM

2665 QUANTITY

10 MB

ICP
DSD
RANDALL
XEBEE

Practical Precision Design for Performance and Dependability

Microdata Marathon Cartridge Disc Drives offer a solution to the random access storage requirements of small- and medium-sized computer systems. As a peripheral device to your computer, a Marathon disc drive can provide up to 10 million bytes of on-line storage in 8.75 inches of rack space. Average access time is 35 milliseconds.

Microdata disc drives are available in single- and dual-disc configurations, and with 100- or 200-track/inch recording density. Single-disc versions use an IBM 5540-type removable disc cartridge for large on-line capacity and unlimited off-line storage on additional cartridges. The dual-disc drives employ the removable cartridge, plus a permanent rotating disc.

Use of the removable cartridge allows a large library of programs and data files to be maintained off-line from the system. The cartridges can be quickly changed, allowing information stored off-line to be updated or loaded into the computer in a matter of moments. With the dual-disc drives, data can be copied from the permanent disc onto a cartridge to produce backup copies of critical information.

The disc drive head positioning system is designed for high speed and extremely accurate head positioning over the desired track. The 35-millisecond average access time means faster response to computer requests, particularly important in real-time and time-sharing environments. The positioning accuracy allows a cartridge written on one Marathon disc drive to be

read on any other Marathon disc drive, even when they are operating in different environments.

Microdata disc drives are the product of careful planning and the application of new and state-of-the-art technology. The result is a line of disc drives that not only meets, but exceeds, the requirements of performance, reliability and economy demanded for today's computing systems.

Microdata Marathon disc drives are the result of a practical approach to disc drive design. Simplicity, precision and new technology have produced disc drives which offer total capability in performance, capacity, reliability and convenience of operation.

Head Positioning

Microdata has developed a system that quickly positions the recording heads precisely over the desired track on the disc surface. The accuracy is consistent from one drive to the next, allowing cartridges to be written and read interchangeably on all Marathon disc drives.

The read/write and erase heads are mounted on a low-mass carriage that rolls on precision steel bearings. The head carriage is driven by a powerful linear motor that is capable of a full stroke across the disc in less than 70 milliseconds.

Drive Model	Number of Discs	Number of Recording Surfaces	Track Spacing	Drive Capacity (bytes)	Data Transfer Rate
9100 (1500 rpm) 9110 (2400 rpm)	1	2	100 tpi	2.5m	200K bytes/sec 312K bytes/sec
9200 (1500 rpm) 9210 (2400 rpm)	2	4	100 tpi	5m	200K bytes/sec 312K bytes/sec
9101 (1500 rpm) 9111 (2400 rpm)	1	2	200 tpi	5m	200K bytes/sec 312K bytes/sec
9201 (1500 rpm) 9211 (2400 rpm)	2	4	200 tpi	10m	200K bytes/sec 312K bytes/sec

The high positioning accuracy is achieved using a photo-optical system consisting of precision calibrated grating and reticle, and multiple pairs of photo cells. The photo-optical system provides position information to the motor drive servo system throughout seek operations. The combination of the high performance servo system and the low-mass carriage results in rapid head positioning to within 0.0002 inch of the nominal track center. Repeatability is ± 50 millionths of an inch.

A special-design velocity transducer is employed to provide control of acceleration, speed and deceleration of the head carriage. The result is smoother head positioning, minimum wear on the carriage assembly and reduced head settling time at the desired track.

Absolute Air Filtration

Microscopic particles of dirt, dust or smoke in a disc drive can contaminate the recording heads and disc surfaces. These contaminants can cause scratches that will impair the critical aerodynamics of the flying heads. To minimize environmental contamination, Microdata disc drives contain a system of absolute air filtration that removes all potentially hazardous particles and circulates clean air over the recording surfaces, drive mechanics and electronics. This air circulation serves to cool and constantly purge the drive.

Positive air pressure is maintained within the drive. During cartridge changes the blower continues to operate, preventing foreign matter from entering the drive.

Structural Integrity

Microdata disc drives incorporate a minimum of mechanical assemblies. All assemblies bolt directly to precision machined surfaces on the aluminum main-frame casing, resulting in precise alignment. All major components in the drive are manufactured by Microdata, assuring complete, direct control of the critical tolerances.

Inherent in the mechanical design is a high resistance to variations in positioning accuracy caused by changes in temperature. In the 200-track/inch drives, where positioning accuracy is important, thermistors monitor temperatures within the drive and electronically compensate for dimensional variations.

Data Reliability

The precise head positioning is the most important single factor contributing to the *soft* (recoverable) error rate of one bit in 10^{10} . The read/write electronics follow proven conservative designs which exceed military reliability standards. The drive enclosure provides shielding from nearby radiation sources, while effective

internal ground isolation protects against errors caused by high current devices connected to the primary power line.

Disc Drive Electronics

In Marathon disc drives, integrated circuitry is used wherever possible for high reliability and low heat dissipation. The data, positioning and interface electronics are totally contained on four printed circuit (PC) cards. Each circuit module contains the circuitry for a particular drive function, providing for fast fault isolation and correction.

Rotational Drive System

Disc rotation is crystal controlled. Special circuits are employed to control the speed to within ± 2 percent.

The time required for data to be written or read after the heads are positioned is a function of:

1. The time for the proper sector to rotate into position under the heads.
2. The data transfer rate.

The standard rotation speed for Marathon disc drives is 1500 rpm. At this speed the average rotational latency is 20 milliseconds, with a data transfer rate of 200,000 bytes/second. As an option, 2400 rpm disc speed increases the data rate to 320,000 bytes/second and reduces the average latency to 12.5 milliseconds.

Compact Packaging

Compact packaging allows more storage in a given amount of rack space. Marathon disc drives are 8.75 inches high, including an internal power supply. Slide mounting allows the disc drive unit to be extended from the front of the rack for loading and unloading of the disc cartridge and for service.

Safety

Marathon disc drives contain a comprehensive system of interlocks to protect against operational errors which could present a hazard to the stored data, the drive mechanism or to the operator. The disc cannot rotate unless the removable cartridge is correctly installed in the drive. To protect the heads and disc surfaces, a carriage interlock prevents the positioning carriage from being extended until the disc has reached the necessary speed for proper head aerodynamics. This same interlock automatically retracts the heads in the event of a rotational failure.

To protect the stored data from inadvertent erasure or over-writing by the program, two manual write protect switches on the front panel selectively inhibit the write electronics of the fixed and removable discs.

Documentation and Technical Support

Microdata Corporation, a leading supplier of computer systems hardware, offers complete support to customers and users of Marathon disc drives. Manuals are available to assist integration of the drives into your system or product line. Complete formal documentation for interfacing, operation, and maintenance is supplied with all units. Microdata's staff is available to assist you with any technical or marketing problems, should they arise.

Custom Interfaces

The interface circuitry in the drives consists of TTL IC logic, compatible with industry standards. Custom connectors and interface configurations can be supplied for plug compatibility with other equipment.

Specifications

Disc Configurations . . .	Model 9100 — single disc, 100 tpi track spacing Model 9101 — single disc, 200 tpi track spacing Model 9200 — dual discs, 100 tpi track spacing Model 9201 — dual discs, 200 tpi track spacing
Storage Capacities	Model 9100—2.5 megabytes Model 9101—5 megabytes Model 9200—5 megabytes Model 9201—10 megabytes
Recording Medium	Removable cartridge is IBM 5440 (or equivalent). All discs are 14 inches in diameter, oxide-coated aluminum sub- strate.
Track Spacing	100 tracks per inch for Models 9100 and 9200 200 tracks per inch for Models 9101 and 9201
Cylinders Per Surface . .	204 with 100 tpi track spacing 408 with 200 tpi track spacing
Disc Rotation Speed . . .	1500 rpm \pm 1 percent, or 2400 rpm \pm 2 percent
Data Transfer Rate	1.562 MHz (200,000 bytes/ second at 1500 rpm 2.5 MHz (312,000 bytes/ second) at 2400 rpm
Head Positioning Time . .	10 milliseconds track to track 35 milliseconds average (ran- dom move) 65 milliseconds maximum (full stroke)
Head Positioning Accuracy	Within 0.0002 inch of nominal track center. Repeatability within 0.000050 inch.

Maintenance

Microdata has service and parts centers in major cities throughout the country. These service centers are staffed with trained field service engineers who can provide training as well as preventative and emergency maintenance service.

A portable disc drive test set (Model 9906) is available for on-site troubleshooting and off-line checkout of the disc drives. The test set simulates controller signals and provides display of data and disc drive operations.

A diagnostic program developed for Microdata computers is available for comprehensive computer testing of the disc drive. The program exercises the disc drive with worst-case data patterns, random seek cycles and checks all controller functions.

Rotational Latency	20 milliseconds average at 1500 rpm 12.5 milliseconds average at 2400 rpm
Mean Time Between Failure (MTBF)	Greater than 5000 hours
Mean Time to Repair (MTTR)	0.5 hour maximum
Recoverable Error Rate	Less than 1 bit in 10^{10} bits transferred
Nonrecoverable Error . .	Less than 1 bit in 10^{12} bits transferred
Air Filtration	0.3 micron, positive pressure
Dc Power	Internal dc power supply
Disc Drive Dimensions . .	19 inches wide, 8.75 inches high, 27 inches deep
Weight	120 pounds
Ac Power	115 Vac \pm 10% at 1.5A (aver- age) or 220 Vac \pm 10% at 0.8A; 59.5 to 60.5 Hz or 49.5 to 50.5 Hz.
Operating Environment.	55° to 105°F, 10% to 80% relative humidity without condensation.

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