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Contents

Compaq AIT 35 Tape Drive Technology

Abstract: Introduction of Advanced Intelligent Tape (AIT) technology into the Compaq midrange server line efficiently addresses the data storage management needs of the workgroup and small departmental server market. The Compaq AIT 35 tape drive was designed to provide backup protection for large amounts of critical business information in this key market sector. The high-speed 8 mm tape drive offers a native storage capacity of up to 35 GB and a transfer rate of 3 MB/s in an industry-standard 5.25-inch half-height form factor. The high reliability, capacity, and data transfer rates of the Compaq AIT 35 tape drive ensure unparalleled dependability in the midrange server market.

This white paper discusses the features of the new Compaq AIT 35 tape drive and the benefits provided to the midrange server market.

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Introduction to Advanced Intelligent Tape

Today's corporate climate depends on data storage technology that efficiently provides backup protection for large amounts of business-critical information. In many business operations, magnetic tape backup is the preferred data storage solution because of the low cost per megabyte of data stored. Technological advances in the magnetic tape market offer improved capabilities in backup solutions.

The method a company uses to back up its data must offer high levels of speed, capacity, and data integrity. Advanced Intelligent Tape (AIT) technology was designed to address these requirements in the mid-range server market. The technology features advanced hardware, media, performance, and capacity for successful daily electronic storage operations.

AIT 35 Technology

Increasing data storage requirements in the midrange server market has created a need for high-capacity, cost effective backup technologies. With the AIT 35 tape drive, Compaq offers an exceptional combination of data integrity, speed, price, reliability, and storage capacity to this market.

Compaq's AIT 35 technology provides protection for business data, with minimal backup time and media expense. The AIT 35 tape drive provides management and retrieval of data quickly and accurately. Compaq's AIT 35 tape drive technology was designed specifically for the workgroup and small departmental server market to reliably store large amounts of business-critical information in a small form factor.

The Compaq AIT 35 tape drive includes many advanced features in backup technology. The drive incorporates Advanced Metal Evaporated (AME) tape technology, Memory In Cassette (MIC) technology, and multilevel error correcting methodology, in an industry-standard half-height form factor. These features ensure quality, cost effectiveness, and exceptional backup results for the midrange server market.

Interface

The Compaq AIT 35 tape drive connects to the host system through Fast-Wide SCSI technology to maximize data transfer rates. The Fast-Wide SCSI interface allows throughput capabilities of up to 20 Mbytes per second. Fast-Wide SCSI technology effectively handles up to two AIT 35 tape drives on a single bus.

Media

The Compaq AIT 35 tape drive uses the durable Advanced Metal Evaporated (AME) tape, which includes a 100 percent pure cobalt magnetic layer and relies on a Diamond Like Carbon (DLC) protective coating for increased strength and durability. The dual magnetic layer design results in low initial error rates and extended recording life. High density recording and low tape tension reduce drive head wear and improve system performance. AME media is highly resistant to oxidation and moisture, which minimizes drive contamination and results in less frequent cleaning of read/write heads.

Recording Format

Helical Scan recording is used to write data to AME tapes. Helical Scan relies on both tape and head movement, resulting in a lower tape speed and high data rates to the tape. Decreased tape speed produces less wear on the tape and head, and allows better control of the tape as it moves along the tape path. This recording method also allows the stop, rewind, and start sequence to be performed very quickly, resulting in less mechanical stress on the drive.

Helical scan recording uses a rotating read/write head assembly (see Figure 1) to write data to AME media. The tape is pulled out of the cassette and partially wrapped around the rotating head mechanism, while data tracks are written at an angle. This recording style results in:

- Imroved tape tracking
- Greater recording stability
- Reduced head wear
- Decreased media wear
- Increased recording performance

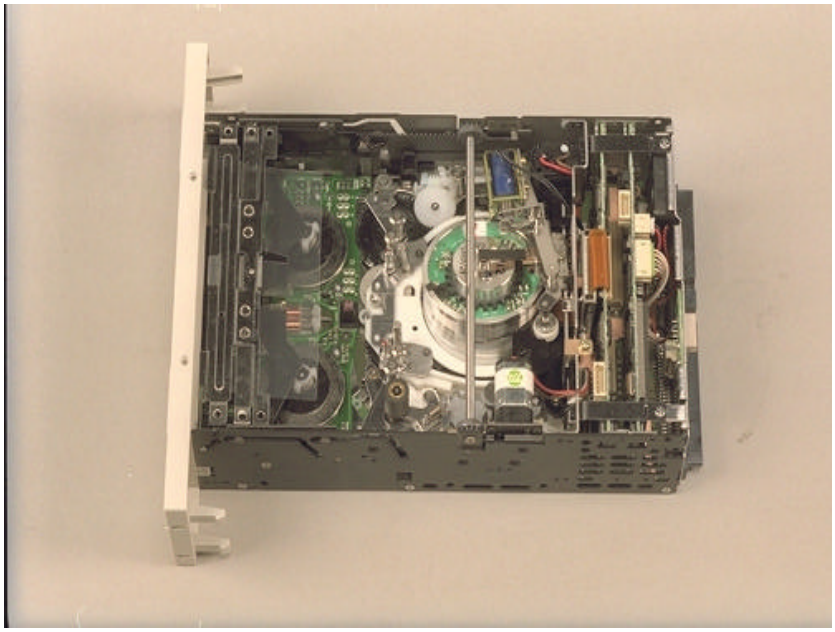

Figure 1. Internal view of helical scan rotating head assembly

Performance Features

The Compaq AIT 35 tape drive offers the following performance features:

- 35 GB native capacity
- 3 MB/s native transfer rate
- 5.25-inch half-height form factor
- Memory In Cassette (MIC)
- File data location markers
- User defined volume and partition information
- Proactive head cleaning
- Read after Write Data Verification
- Error Correction Coding (ECC)

MIC

The Compaq AIT 35 tape drive's fast access speed can be attributed to Memory-In-Cassette (MIC) technology. MIC allows high-speed media load, file search, and read/write access. This speed advantage is the result of a 64-Kbit electrical erasable programmable read-only memory (EEPROM) chip placed inside the data cartridge. A serial interface to the memory chip allows the Compaq AIT 35 tape drive to store and retrieve a tape's data log, history, and directory information before the tape starts to move.

MIC compliments the header on the tape. The MIC chip stores pointers to accelerate the time for loading data and searching for information on the tape. Important file search information can be stored in an index and in a directory, allowing for faster data retrieval with applications that support MIC.

Drive firmware estimates how far to fast-forward or rewind without reading individual address ID markers as the tape is moving. Data search speeds up to 150 times the normal read/write speed of the drive are possible. A high-speed fast forward search option allows for spacing forward several files at a speed of up to 120 inches per second.

MIC allows the data tape to be ramped up, or available for host system commands, in approximately 40 seconds. The Compaq AIT 35 tape drive supports up to 256 tape partitions and can load the tape at any partition's pointer (with supporting applications). The drive can read the MIC system log and capture the information needed to access the requested file, then proceed to the targeted file without first reading the tape. The drive does not have to rewind to the beginning of the tape to retrieve information. This reduces wear and tear on the drive's mechanical components, both during the initial load process and during operation, while providing faster file access.

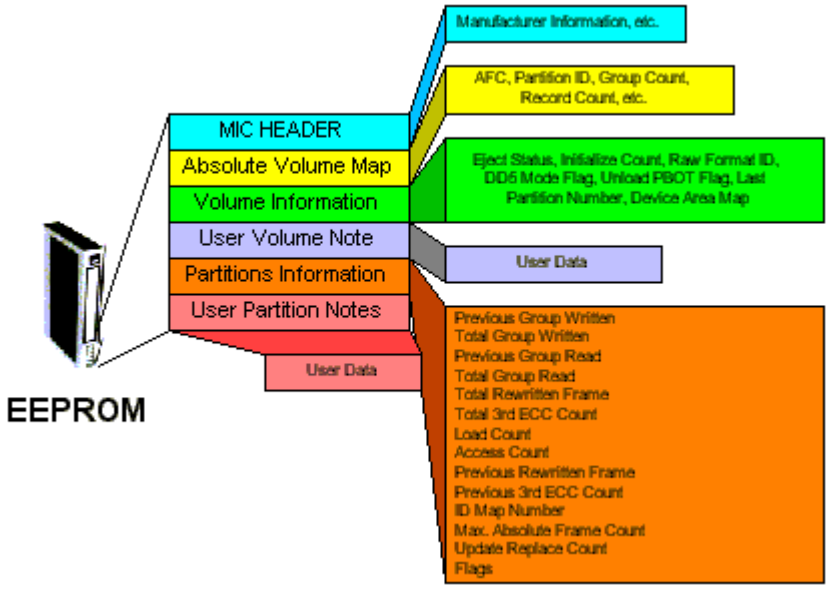

Figure 2. The MIC Concept

Benefits:

- Faster data retrieval
- Faster and more reliable access to volume serial information
- Advanced diagnosis of media wear and tear
- Higher levels of data integrity through a fault tolerant system log
- Increased data-set management capabilities

Head Cleaning

Compaq takes a proactive approach to keeping tape heads clean. The Compaq AIT 35 tape drive features a built-in cleaning mechanism that prevents and recovers from head contamination. The Compaq AIT 35 tape drive has an estimated Annualized Failure Rate of 3.5 percent with an MTBF of more than 250,000 hours.

Deteriorated, dirty, or damaged heads are a primary cause of tape drive failure. The percentage of time the drive is actually reading or writing data and rewinding or repositioning tape significantly decreases with clean, operable read/write heads.

The proactive head-cleaning mechanism prolongs head life by reducing error rates. A low error rate increases the total number of tape motion hours that read, write, and servo heads will operate without failure. The possibility of dropouts, media errors and format failures being caused by unclean read/write heads decreases. Buildup on read/write heads is minimized and drive maintenance and overall operating costs are reduced.

Benefits:

- Highly Reliable Mean Time Between Failure Rating (MTBF)
- Extended head life
- Less frequent need for head cleaning
- Reduced drive operating costs

Multiple Error Correction Methods

The AIT 35 tape drive enhances data integrity through a multiple error correcting methodology that includes read-after-write and ECC. Effective data recovery strongly relies on accurate error detection. Read-after-write detects and corrects any write irregularities immediately.

ECC methods are used to reconstruct data that cannot be accurately read during restore operations. Compaq's AIT 35 tape drive is designed to minimize the frequency and level of errors during the backup process.

Benefits:

- Higher level of error detection
- Increased level of error correction
- Faster data recovery

Capacity Features

The Compaq AIT 35 tape drive offers a capacity of up to 70 GB per cartridge with compression. The drive allows for a data transfer rate of 6 MB/s with compression, and a 9.6 GB/hr sustained transfer rate. Capacity features also include integration of the Adaptive Lossless Data Compression (ALDC) algorithm.

Capacity features include:

- 35 GB native capacity
- 70 GB compressed capacity
- 3 MB/s native transfer rate
- 6 MB/s compressed transfer rate
- 9.6 GB/hr sustained transfer rate
- 21.6 GB/hr maximum transfer rate
- Adaptive Lossless Data Compression

Packaged Models

Compaq's AIT 35 tape drive is available in two models:

Figure 3. Internal 5.25-inch half-height AIT35 tape drive

Figure 4. External tabletop AIT35 tape drive

Compatibility

The following operating environments support the Compaq AIT 35 tape drive:

- Windows NT 4.0 or higher
- NetWare and IntraNetWare
- Compaq Tru64 UNIX 4.0f or higher
- SCO UNIX 7.x, 2.x
- Open VMS

AIT 35 Software support is provided by:

- Seagate Software Backup Exec 7.2 for Windows NT
- Seagate Software Backup Exec 7.5 for NetWare
- Computer Associates ARCserve*IT* 6.6 for NT
- Computer Associates ARCserve*IT* 6.5 for NetWare
- Legato Systems NetWorker 5.5

Conclusion

Businesses are experiencing a tremendous increase in the need for reliable and cost-effective data storage management options. The Compaq AIT 35 tape drive meets the demand for fast, high capacity backup solutions in the midrange server market. This reliable and cost-effective tape drive was designed to address the increasing data storage needs of this market sector.

The Compaq AIT 35 tape drive offers this market up to 70 GB of compressed storage capacity in an industry-standard form factor. The AIT 35 tape drive ensures that large volumes of data can be managed with an exceptional level of data integrity. The Compaq AIT 35 tape drive is compatible with most major operating environments and industry-leading software applications. The state-of-the-art Compaq AIT 35 tape drive is the optimal data storage solution for the workgroup and small departmental server market sector.