

# Optical Storage Overview

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It may sound strange, but the first optical recording technology was invented about 5000 years ago, when the Egyptians started using hieroglyphic and alphabetic writing systems.

Writing allowed storing, retrieval, and duplication of data without errors (except for misspellings and misunderstandings). Today's meaning of optical data storage refers to storage systems that use light for recording and retrieval of information.

Photography was the first example of optical data recording in the modern sense. The first photographs were developed about 200 years ago and represented an analog optical storage, which has a limited application for information storage since it is difficult to interface analog data with machines, plus there is a continuous degradation of data at every step of reading and writing. But, light can be easily used for digital information recording, especially since the invention of the lasers.

Optical recording was for a long time, and is still, considered a future replacement for magnetic recording. Optical recording systems potentially have much greater reliability than magnetic recording systems since there is a much larger distance between the read/write element and the moving media. Therefore, there is no wear associated with repeated use of the optical systems. Another advantage of the optical recording systems over the best performing magnetic recording systems - hard drives - is their removability.

Optical drives of all kinds operate on the same principle of detecting variations in the optical properties of the media surface. CD and DVD drives detect changes in the light intensity, MO drives - changes in the light polarization. All optical storage systems work with reflected light.

A convenient way to define tracks on the optical disks is by using pre-grooves. These are created by etching, stamping, or molding the substrate. The bottoms of the grooves are used as a storage medium, and the grooves are separated by lands. But, the lands could be also used as a storage medium, instead of or together with the grooves. The groove depth is based on the laser wavelength and, typically, equals  $1/8$  of the wavelength of the laser beam.

Another way to define tracks and provide servo information for the drive's electronics is to use a so-called sampled servo, where the tracks are defined by occasional marks placed on the substrate at regular intervals. The marks define the outer limits of the track and help to position the laser spot on the track.

It is usually desired in optical recording to achieve the smallest laser beam spot possible, since the spot size is a measure of the bit size, which defines the aerial density of the storage system. The spot size also affects the resolution of the system (smaller is better).

## **Where and why should we use optical storage?**

### **WORM Optical Storage**

Thanks to numerous Wall Street scandals and tighter regulations across a number of industries, IT managers are being forced to account for, preserve and, on demand, restore data. This has created a big market for WORM optical storage systems.

For financial services companies, the Securities and Exchange Commission's SEC Rule 240.17a-4(f) created a requirement forcing companies to store data (e-mail and business records) on non-rewritable and non-erasable media. SEC Rule 240.17a-4(f) also requires that duplicate storage media keep track of the time and date of each data item for the required retention period.

WORM optical technology can also help organizations come into compliance with HIPAA (Health Insurance Portability and Accountability Act). For example, according to HIPAA guidelines, patient records must be kept in secure data repositories and retained for two years after a patient's death. Although HIPAA does not specify any particular technology for doing this, the act's security requirements (preventing records from being altered) and mandated retention periods suggest that WORM optical storage be used to protect records.

During the past year, a number of WORM optical storage systems have emerged that will help meet the needs of IT managers challenged with meeting any number of business and regulatory requirements. Optical storage, a mature technology with which many organizations are familiar, remains the most popular WORM solution. CDs and DVDs live in the low end to midrange of the optical storage market, with a host of available library devices to take care of disk management.

While Magneto-optical disks are more expensive than DVD or CD media, they do have a higher level of reliability, which is why they are often found in government agencies and financial institutions as well as being the storage medium of choice for medical imaging.

WORM optical makes is the ideal storage solution for companies that have to archive a large amount of data for multiple years and be able to retrieve it within minutes, WORM optical is the proven technology for long-term storage.

### **So what's wrong with tape?**

For many years, IT managers have leaned on tape backups as the cornerstone of their disaster recovery and data protection infrastructure. Tape won't be going away any time soon, but changing business environments and the need to come into compliance with a variety of new regulations are forcing IT managers to rethink their strategies for data protection.

Although tape is a reliable and portable media format, it does not meet all the current needs of customers. For years, the term "archival" was used to describe data that was in its long-term, decreasing value stage, and was most often stored on optical media. Today magnetic tape is not a suitable solution for Information Lifecycle Management (ILM) Archiving applications based on the fact these applications are driven by databases that randomly access content, this content could be an E-mail, attachment or other document(s).

Tape cannot realistically support this type of random-access requirement. Additionally, tape solutions have a long history of reliability issues and should only be considered in backup applications that typically do not require random-access. Over-positioning a magnetic tape solution within a database/random-access driven archive applications could have serious performance, availability, reliability consequences. From a compliancy requirement standpoint tapes are magnetic by design a WORM tape cartridge can be easily erased via a standard bulk erasing tool

or other electronic mechanisms. WORM tape does not stand up to the compliancy test for; Non-alterable, Non-erasable media.

The changing business and security climate has made WORM optical-based storage more compelling for many organizations. Regulations from the SEC, specifically SEC Rule 240.17 a-4(f), and the Health Insurance Portability and Accountability Act have a number of rules regarding document retention and preservation. WORM storage systems help IT managers address many of these, including guidelines for e-mail, financial records and patient information.

Even if your company is not required to meet any of the guidelines mentioned here, it's a good idea to audit your technology systems and data retention practices to see how they would measure up. New regulatory deadlines loom all the time—with the first Sarbanes-Oxley Act deadline just around the corner—and you never know when these or other guidelines will affect your industry.

### **Data Safety Push**

Business practices and regulations have evolved in such a way that it is now necessary not only to have geographically dispersed copies of data but also to have non-rewritable and non-erasable media to protect it. Here are examples of regulations that suggest or require better data retention and protection.

- The SEC's Rule 240.17 a-4(f) calls for organizations to store business documents for no less than three years while keeping data in an accessible place for two years.
- HIPAA has a number of guidelines for document retention and security. Although WORM is not specifically named, it is very often the best choice for preserving the integrity of data for several years.

### **Do Laws Exist for Admitting Optically Stored Records?**

Yes! In all fifty states there are laws that provide a solid legal foundation for admitting optically stored records in court. Although the specific legal basis may differ from one state to another, in most states it is found in the Rules of Evidence. It also can be in the statutory laws.

The key part of the Rules of Evidence provides for the admissibility of "data compilations." This term was introduced into evidentiary law to describe machine readable, computer processed information. It was included in the 1974 revision and the 1975 revision of the Federal Rules of Evidence.

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