



A compact disc (CD) is a laser-read (also termed optically read) data storage device on which audio, video, or textual material can be stored. It is used extensively to record computer data, digital photos, audio files, etc. It differs from the conventional phonograph record in that it stores information in digital, rather than analog, form. Stereophonic (two-channel) sound signals are digitally sampled at a rate of 44,100 times per second per channel. Each sample is expressed as a binary number value consisting of 16 binary digits, or bits.

The sampled digital values, along with error correction data, tracking codes, and cueing data, are recorded on a master digital tape, which, after a series of intermediate steps, is used to make compression-molded plastic discs 12 cm (4.72 in.) in diameter, each covered by a thin, reflective metallic layer and protected by a clear plastic coating.

During playback, a low-powered laser beam, mounted in a movable assembly, reads the digital data through the reflective rear surface of the disk by differentiating between the presence and absence of "pits" beneath the clear, transparent surface of the CD. Changes in reflectivity caused by the pits are translated, via a photo diode, into electrical signals that are converted to signals for reproduction by conven-

tional amplifiers and loudspeakers or digital computers.

The advantages of the CD over conventional records or tapes include more uniform and accurate frequency response, a complete absence of background noise, wider dynamic range (the difference between the softest and loudest recordable musical sounds), and absence of wear—since nothing mechanical touches the surface of the disc when it is played.

Of particular interest to printers, photographers and Graphic Artists is the CD format called CD-ROM (Compact Disc Read-Only Memory), used for the storage of computer text or programs. Typically, a CD-ROM can store approximately 560–700 megabytes (millions of bytes) of data.

A companion format is the writable CD-ROM (CD-RW) which is very popular in the computer end of graphic arts and printing establishments. It provides a very accurate storage and transport medium for large graphic and text files as well as computer software backups.

The Photo CD has all but totally captured the stock photo industry, providing a highly efficient method of distribution and protection for stock photographs used by agencies and printers. With this system, (nearly) the entire catalog of available art of photos can be distributed to any sub-

scriber. The data is designed in such a way as to provide small preview or "thumbnail" (low resolution) views of the available art.

Some companies merely require a telephone call and they will provide an appropriate code to "unlock" specific photos or art. It then can be accessed in full resolution for use in any artwork being prepared.

A similar system is being used by typographic companies for font distribution. The user purchases, for a very minimum price, a CD with a few fonts which are unlocked. Normally a catalog of all of the available fonts is provided with the purchase.

When a new font is required to meet specific needs it merely requires a telephone call to secure an unlocking code.

Many other uses of CD technology have been developed in a variety of formats. Standard CD-ROMS are great for computers and data storage; a CD-V will play 20 minutes of sound and show 5 minutes of sound-with-picture on a television set equipped with a special player. Laser videodiscs, with Dolby and THX sound, can show entire movies on a TV screen.

The medium has all but replaced serious distribution of movies and instructional videos.

Because they are nonlinear and provide random access, they

are able to interact and respond more quickly to viewer selections without rewinding as is necessary with conventional tape systems.

The world of computer games would not be possible without their ability to store large amounts of graphical data.

In the graphic communications industry they have become a very common storage and transport medium between designers and production personnel.

The most recent developments utilizing the technology is the DVD system. It utilizes a shorter wavelength laser which permits the pits and grooves to be smaller and their spiral grooves to be narrower and closer together. This system can pack 4.6 GB of data in the same space as a conventional CD-ROM which can hold 650 MB.

The DVD technology is more advanced in another way. The technology allows for two layers of pits and grooves on each surface.

The special pickup laser is designed to focus on either or both of the two layers, each of which have different information.

Further refinements of the DVD standard allows data to be written on both sides of the disc. While no company has utilized this capability commercially, a DVD has the potential to store 4 - 4.6 GB layers of information for a total of over 17 GB on a single disc.

A number of companies are still endeavoring to expand the storage capacity of this disc

system. Some researchers have said that only minor breakthroughs will be necessary to enable the storage of terrabytes of information on a disc.

The basic technologies planned for these storage capacity devices also provide quicker data access.

The current state of the industry is a moving target. Each month produces faster machines for reading and writing data using the basic CD format.

Some vendors have manufactured mini-discs which are smaller in diameter or even asymmetrical in shape. Most of them will play on standard CD players. They were initially utilized as promotional materials for corporations, but now a number of software manufacturers are using these smaller and more economical discs for software. IBM uses the mini-disc format to distribute software for its optical computer mice. A number of small program manufacturers are doing the same thing.

The technology has become so prevalent that Apple Computer has entirely abandoned the floppy diskette in favor of a CD-RW drive on its new machines. Other vendors are expected to follow. The meager storage capacity of diskettes, their tendency to fail and their unreliable shelf and storage life all make CD technology the system of choice in modern data processing, software distribution and data storage.