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ERIC Development Team

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Optical Disk Formats: A Briefing. ERIC Digest.

The first optical disks that became commercially available, around 1982, were compact audio disks. Since then, and during a particularly active marketing period from 1984 to 1986, at least a dozen other optical formats have emerged or are under development. The rapid proliferation of formats has led, understandably, to some confusion. This digest will briefly describe the most prominent formats (and their acronyms), and the contexts in which they are used.

Optical disks go by many names--OD, laser disk, and disc among them--all of which are acceptable. At first glance, they bear some resemblance to floppy disks: they may be about the same size, store information in digital form, and be used with microcomputers.

But where information is encoded on floppy disks in the form of magnetic charges, it is encoded on optical disks in the form of microscopic pits. These pits are created and read with laser (light) technology.

The optical disks that are sold are actually "pressed," or molded from a glass master disk, in somewhat the same way as phonograph records. The copies are composed of clear hard plastic with a reflective metal backing, and protected by a tough lacquer. As the disk spins in the optical disk player (reader, drive), a reader head projects a beam from a low-power laser through the plastic onto the pitted data surface and interprets the reflected light. Optical disk players can stand alone, like portable tape players, or be connected to stereos, televisions, or microcomputers.

Optical disks lack the erasability and access speed of floppies, but these disadvantages are offset by their huge storage capacity, higher level of accuracy, and greater durability.

OPTICAL DISK FORMATS

Optical disk formats are described by capability, information form, and disk size. The most familiar capabilities are: o Read Only Memory (ROM, RO): permanent, unalterable storage,

currently the only firmly established format. o Write Once, Read Many (WORM, WO): new data can be written to the

disk, but existing data cannot be altered or erased. The drive

head contains two lasers: one for reading, and a more powerful

laser for etching new data pits. WORM capability may reduce

storage capacity by a third. Both 5.25- and 12-inch versions were

marketed around 1985. o Interactive (I): stores information in any or all forms, along

with interactive programming that allows flexible access, animates

visuals, runs games, etc.; similar to the capabilities of

microcomputer software. o Erasable (E): information can be deleted and overwritten. This

format requires complex technology and is still being developed.

These capabilities may or may not be available on disks containing different forms of information--audio, text or data, video or graphics, or a combination. And various forms

of information can be found on different sizes of disk, most often 12 or 4.72 inches in diameter. Some 12-inch formats are: o Optical Digital Data Disk (OD3, ODD): contains digitized information (bits), usually text, sometimes images, and used primarily in business and research settings. The disk may have ROM or WORM capabilities. o Video Disk (videodisc, laser video disk, LV, reflective optical video disk): carries sound and moving images--movies--as analog (continuous) signals. The disk itself may be silvery, reflecting colors for a rainbow effect. o Digital Video Disk (digitally encoded video disk) contains digital video, audio, and/or text. Still video is more common than motion video because it is more economical to store and easier to access. Digital motion video must be converted to analog signals for playing on standard home televisions. The disk may also include some interactivity programming. o Interactive Video Disk (IVD): stores 54,000 still frames or 30 minutes of full-motion video with audio. A microcomputer interface allows IVD to gain some interactive capability, although interactivity is hampered by the analog video signal. This format has applications in education, business and industrial training, public information terminals, and games and other entertainment.

Most compact disks (CDs) are 4.72 inches across; a few are 5.25 inches. Audio, text, and still video are stored on CDs. The first two formats below are the most commercially successful to date: o Compact Audio Disk (digital audio disk; CD-audio): contains digital stereo audio signals, generally 75 minutes of high-fidelity, static-free music. o Compact Disk-Read Only Memory (CD-ROM): has tremendous storage capacity, used to store text databases such as bibliographic indexes. One compact disk holds 550 MB of data, the equivalent of 1,500 floppy disks. This amounts to 275,000 pages of information or 200 pounds of paper. Audio or still video may be integrated with text. This format is marketed for library, academic, and professional applications. o Compact Disk-Write Once, Read Many (CD-WORM): often contains text or text with still images (see WORM). Several 5.25-inch formats with write and possibly erase capabilities are also under development.

FUTURE FORMATS

The next wave of optical disk formats is about to break. This year or next we are likely to see:
o HDTV Video Disk: a digital format that is readable by high-definition television, with more than double the number of lines per screen.

o Compact Disk-Interactive (CD-I): a writable, very adaptable format that will store text, multichannel audio at several quality levels, still or motion video with low- or high-definition, and animated graphics. Signals may be all digital or include some analog video. CD-I players can stand alone or link to home entertainment systems. This disk and a similar product, compact disk video (CD-video, CD-V), are targeted for mass-market education and entertainment.

o Digital Video Interactive (DVI): similar to CD-I, but a highly integrated system that promises more. Compressed digital signals allow the storage capacity of CD-ROM and more motion video than CD-I and IVD: up to an hour of video, with multitrack audio. This disk also has the interactive graphics capabilities of a microcomputer program. Applications include simulations, video paint, special effects, sales tools, and scientific imaging. DVI's release is slated for 1990 or later.

o Compact Disk-Erasable Magneto Optic (CD-EMO): combines optic and magnetic technologies in a format that is expected to be easily erasable and reusable for 10 years. Like WORM, EMO requires a drive head with separate read and write lasers. In writing, heat from the laser works in conjunction with a change in magnetic polarity to change the shape of the pit. The erasable disk should also appear within two years.

CONCLUSION

With the exception of audio CD, CD-ROM, and video disk, the optical disk formats described here are largely experimental: just released or about to be released. And because the technology is so new, there are very few standards for compatibility of hardware or software, or for encoding, accessing, or integrating data in various forms. But these problems will disappear within the next few years, with optical formats and optical systems that offer... o o

players o o o

different wavelengths or colors o o o

networks o o

organization o o ...just to name a few. The optical technologies industry is moving so fast that the only way to keep up is to contact manufacturers directly, and to read periodicals. CD-ROM REVIEW,

ELECTRONIC AND OPTICAL PUBLISHING REVIEW, OPTICAL INFORMATION

SYSTEMS, DATABASE, and JOURNAL OF INFORMATION AND IMAGE MANAGEMENT all focus on optical technologies; while BYTE MAGAZINE, INFORMATION TODAY, and PC WORLD take a more general look at high-tech developments. Special issues of two journals focus on CD-ROM for libraries: THE BULLETIN OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE, 14(1), October-November 1987; and WILSON LIBRARY BULLETIN, December 1987.

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