

Technology Today

Alan J. Pierce



Reading, Writing, and CD-R

THE beginning of Arnold Schwarzenegger's movie *Eraser* introduces viewers to a small gold disk which contains recorded evidence of espionage. This is a compact disk-recordable, or CD-R, and the technology that it represents is real. They were invented in 1989 at the Taiyo Yuden Company in Japan and are now finding their way onto the desktops of businesses, industries, and homes.

CD-R drives read information the same way as CD-ROM drives. What makes the CD-R drive special is that it can actually write, or store, 650 MB of data to its CD-R disks. It can write to each disk only once, but the disks can be read thousands of times.

The CD-R system requires a completely new piece of computer hardware, rather than being just a new kind of disk that you could use with your CD-ROM (compact disk-read only memory) drive. You can, however, share the disks that you make with anyone who has a standard CD drive.

To make certain that everyone is on equal footing, let's look at the principle behind the digital reading of a CD-ROM disk before exploring the technology of the recordable CD. Under very heavy magnification, you could see that a CD isn't just a smooth surface. Rather, the mirrored surface contains billions of microscopic pits. During reading, a laser beam reflects, in rapid succession, reflections from the disk to a photoelectric cell. Reflected light from the mirrored areas is

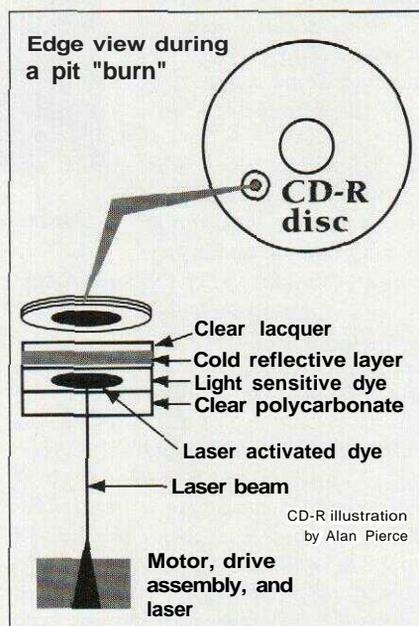
converted to the binary 1's, and signals from the nonreflecting pits are converted to 0's. Finally, your computer converts the string of 1's and 0's into the pictures, animation, and computer programs that you see on your computer screen.

A laser powerful enough to burn pits into a disk would be too expensive to include in individual CD-R drives. These powerful lasers aren't even used to produce the CDs sold in stores. Music CDs and CD-ROMs are produced by injection

molding, a technology similar to that used to make phonograph records.

The mechanism of the CD-R drive and disk are integral parts of one system. A motor with its drive assembly, a laser, and a disk with certain built-in characteristics interact to allow recording. The disk contains a number of layers, as in the figure at left, that include a polycarbonate surface, light-sensitive dye, microscopic reflective gold coating, and clear protective coating that contains the printed label.

During writing, bursts of light from the laser blacken the light-sensitive transparent dye, creating microscopic imitation pits that the computer will read as 0's. In playback mode, the machine's laser power is reduced to read the disk as if it were a commercially produced CD. These drives demand critical manufacturing because they must create fake pits that are read in playback mode 44,100 times a second on a single-speed drive.



Recalling the Facts

1. What is the most significant difference between CD-ROM and CD-R?
2. How does a CD-R drive produce pits on the disk surface?
3. How many times can you record on the surface of a CD-R disk?
4. How many times can you read the surface of a CD-R disk?

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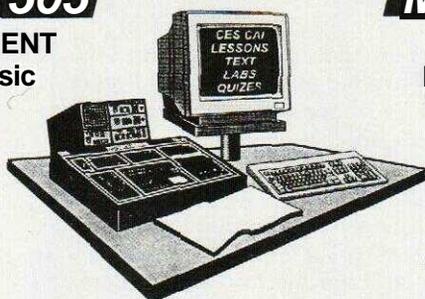
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