CD-ROM Drives: Why They're More Expensive than CD-Audio (9/95)

Article Created: 9 December 1992
Article Reviewed/Updated: 7 September 1995

TOPIC ---

Why are CD-ROM drives more expensive than CD-audio ones?

DISCUSSION ---

The key factors in the high cost of a CD-ROM drive, compared to a CD-audio counterpart, are:

- Speed
- Reliability and Performance
- Longer Warranty
- Economy of Scale
- Additional Electronics

Speed

Faster drive performance in a data environment increases productivity, whereas audio has to be played at a constant rate.

Reliability and Performance

CD-ROM drives are used in data environments which stress reliability and performance. Unlike CD-audio use, where losing a note of music may not even be heard by the listener, in a data environment not reading data accurately may be catastrophic. Additional electronics are needed to ensure data reliability.

Warranty

The typical CD-audio drive is warranted for 30 days. For CD-ROM drives, the warranty period is generally at least one year. The longer warranty period requires the use of more reliable and durable, and hence more expensive components in CD-ROM drives. Also, many CD-ROM drives are purchased by major OEM customers who have stringent quality and reliability standard, which demand the use of more durable and more expensive components.

Economies of Scale

CD-audio drives are produced in the millions of units per month and can leverage off such large quantities. CD-ROM drives, however, are manufactured in smaller quantities, and the special components necessary, therefore tend to be more expensive.

Additional Electronics

The spindle motor (which rotates the disc). Most CD-ROM drives use brushless DC motors, which provide greater durability and reliability than the less-expensive brush motors that are used in most CD-audio drives. The CD-ROM motor typically has a MTTF (mean time to failure) in excess of 10,000 hours (the AppleCD 150 and other Apple CD-ROM drives are specified at 25,000 hours at a 100% duty cycle). The CD-audio brush motors, on the other hand, do not even typically have MTTF requirements: reliability is usually defined in the hundreds of hours, an extreme case being 1,000 hours.

The actuator (which determines the access time). Access time is a critical factor in data devices. In CD-ROM drives, typically a rack-and- pinion or linear motor type of actuator is used to provide access times of less than 500 ms (the AppleCD 300 has an average access time of 295 ms). In CD-audio drives, access time is unimportant, so cheaper, slower actuators are used. The actuator life in a CD-ROM drive must be substantially over 1 million back-and-forth seeks, while for a CD-audio drive one hundred thousand is more than adequate. Thus, a cheaper, less durable mechanism can be used for CD-audio.

CD caddy. In order to protect the disc from mishandling and misread data, many CD-ROM drives use a CD caddy to load the disc into the drive. This means that an additional caddy-loading mechanism is needed in such CD-ROM drives. CD-audio drives do not use caddies, because the loss of music is not catastrophic, as is the loss of data. As the CD-ROM industry gets more experience with CD-ROM disc reliability, there will be a trend to do away with the use of the CD caddy, as is evidenced in some newer, less-expensive CD-ROM drives.

Heavy-duty power supply. A drive with a faster access time and quicker spin-up time requirements, needs a larger, more powerful power supply, which results in additional cost for an external CD-ROM drive. A CD-audio drive can run off ordinary AA batteries, because access time is unimportant.

Error detection circuitry. The need for data reliability requires extra error-detection and error-correction electronics, which are not needed in CD-audio environments.

SCSI controller. An additional SCSI controller (or a comparable interface) is needed to connect a CD-ROM drive to a computer. This is not needed for a CD-audio drive. For external CD-ROM peripherals, two SCSI connectors are typically provided.

Data buffer. To improve data transfer rates in CD-ROM drives, a data buffer is usually used -- typically 32KB or more (the AppleCD 300 has a

256KB buffer) -- resulting in additional cost. No such buffers are needed for CD-audio.

Article Change History:
07 Sep - Made minor correction.

Keywords: <None>

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