TechPort
MSC TRAINING CENTER

SONY

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Sony Media Solutions Company

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WELCOME

By John Matarazzo
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As the market for CD-R and CD-RW optical media explodes, consumers, professionals and businesses are faced with more choices, more possibilities and more products than ever. Unfortunately, the opportunities for confusion have also grown. That's why Sony Media Solutions is devoting another TechPort to this important category.

Back in 1998 we released a TechPort regarding the superb performance of Sony's cyanine CD-R recording layer. This time we'll address the natural questions that have arisen in this diversifying market:

1. What's the difference between CD-R and CD-RW?
2. What distinguishes general purpose CD-R and CD-RW from CD-R Audio and CD-RW Audio?
3. Which drives, recorders and players are compatible with which media?

The answers will help Sony distributors, retailers, professional users, enterprise users and consumers to make the right choices — and get the full benefit of Sony's expanding CD-R/RW universe!

CD-R and CD-RW

The dynamic digital duo

CD-Recordable (CD-R) and CD-ReWritable (CD-RW) are two of the hottest recording technologies on the market. Tough, durable and digital, these incredible discs enable end-users to back up PCs, transport large files and distribute data. They're ideal ways to prototype CD-ROMs. To record CDs of favorite music. And to archive data. No wonder CD-R/RW burners are such hot-selling peripherals — and are being built into so many new PCs. No wonder CD-R Audio recording is becoming a popular part of home music systems.

The basics

CD-R can be recorded only once. And CD-R discs can be read on millions and millions of CD-ROM and DVD-ROM drives. In addition, CD-R discs recorded with CD-format audio can be played back on an even larger population of home, car and portable CD players! This makes CD-R irresistible for millions of customers. Equally impressive, Sony CD-RW media can be recorded and re-recorded up to 1,000 times. Reading is limited to CD-R/RW burners and those CD-ROM and DVD-ROM drives specifically designated as "Multi-Read."

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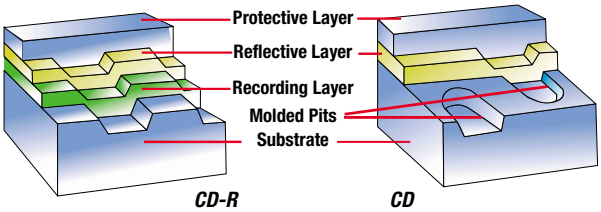
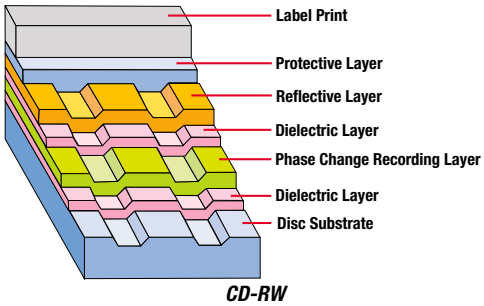
To enable recording, CD-R discs must be visibly darker than CDs.

CD-R and CD-RW

CRX-145SXS





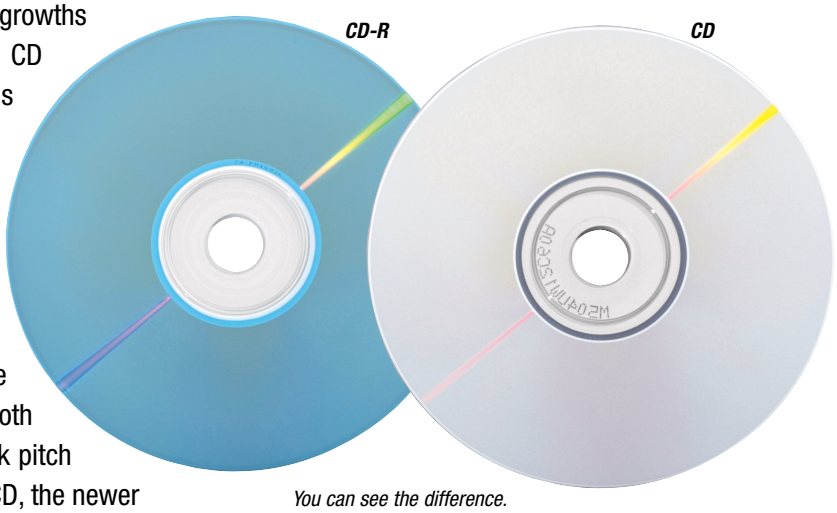
Similarities

Both CD-R and CD-RW are outgrowths of the original Sony/Philips CD Red Book specification. CD-R is defined by the Orange Book Part II as well as the ISO 9660 CD-ROM CD/I standards. CD-RW conforms to the Orange Book Part III. Like conventional CD, both types of discs have a reflective layer. Like conventional CD, both use a spiral track, with a track pitch of 1.6 micrometers. Also like CD, the newer discs both use laser playback, where the alternation between bright and dark reflected light equates to a digital 1. However, in order to record, CD-R and CD-RW establish the course of the spiral track with a pre-molded groove. And both CD-R and CD-RW employ a recording layer, activated by laser, to capture signals on the disc.

The principle of CD-R

CD-R and CD-RW are very different in the way they record signals. CD-R accomplishes recording by burning permanent dark spots in the recording layer. When the laser hits the substrate side of the disc, its light is focused into the groove. The recording layer's organic dye absorbs the laser beam's energy, creating heat. This heat causes the plastic substrate to deform and the dye to chemically decompose. The result is a dark, non-reflective spot on the disc.

By the way, the organic dye makes a difference you can see with the naked eye. To enable recording, CD-R discs must be visibly darker than CDs. Yet CD-R media is light enough to be read on conventional CD-ROM and DVD-ROM drives and standard audio CD players.

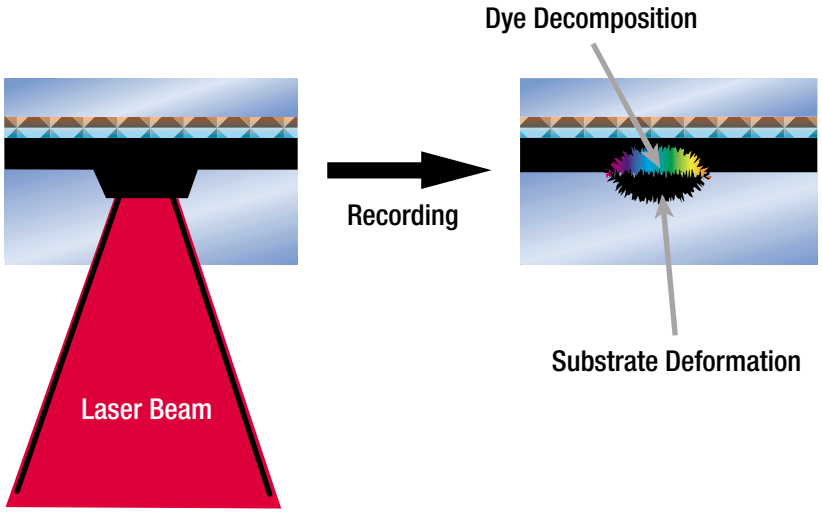


You can see the difference.

CD-R and CD-RW are very different in the way they record signals.

Pit Formation Mechanism of CD-R

To get over 60% modulation amplitude



The CD-RW principle

The permanent recording method of CD-R is not appropriate for the write-erase-rewrite capability of CD-RW. That's why CD-RW uses a phase change film. Heat from the recording laser changes the film between two phases: crystalline (which is reflective) and amorphous (which tends to scatter light). The playback laser then detects the alternation between crystalline and amorphous, light and dark. This process requires a disc surface far darker than CD or CD-R; CD-RW is only 25% reflective. As a result, CD-RW discs can only be read on drives designed at the outset to accommodate a wide latitude in disc reflectivity. To read CD-RW discs, you need either a CD-R/RW burner or a Multi-Read CD-ROM or DVD-ROM drive.

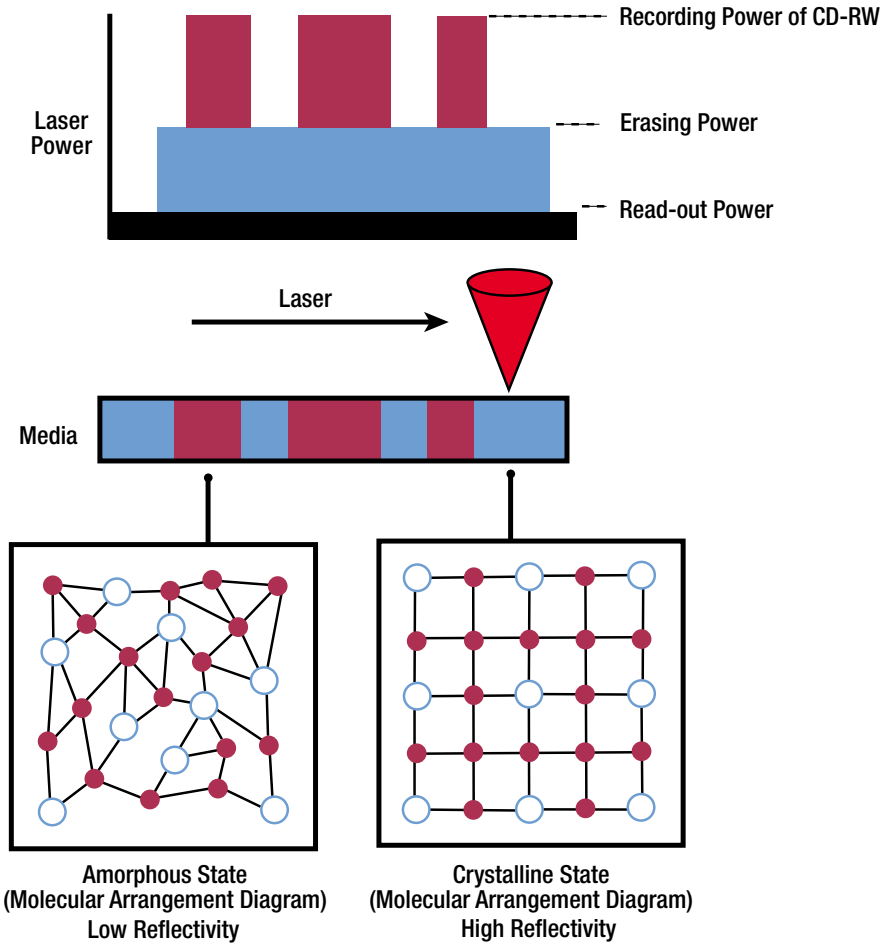
High-speed CD-RW

One additional wrinkle is the new generation of High-Speed CD-R/RW drives. These can record CD-RW at 4X to 10X standard speed — and they're identified by the HIGH SPEED designation as part of the CD-RW logo on the front panel. Sony High-Speed CD-RW discs record beautifully in these drives, and can be read by standard-speed CD-RW drives. However, High-Speed CD-RW discs cannot be written with standard-speed CD-RW drives. That's usually not a problem, considering most customers purchase media for a specific drive.

High-Speed CD-RW discs cannot be written with standard speed CD-RW drives.

Dedicated audio CD-R/RW recorders require media with a special code that identifies the discs for audio-use.

Phase Change Recording Principle



CD-R and CD-RW Compatibility Chart

	Media for Data Files	CD-R	CD-RW	CD-R Audio	CD-RW Audio
Write Drive	CD-R/RW Drive	Yes	Yes	Yes	Yes
Read Drives	CD-R/RW Drive	Yes	Yes	Yes	Yes
	Multi-Read CD-ROM Drive	Yes	Yes	Yes	Yes
	Multi-Read DVD-ROM Drive	Yes	Yes	Yes	Yes
	CD-ROM Drive	Yes	No	Yes	No
	DVD-ROM Drive	Yes	No	Yes	No

Compatibility for data files. In most cases, the user's drive and application will dictate the choice of media.

Trim

It's quite remarkable that end-users can now work with technology previously limited to an elite group of industrial users.

CD-R Audio and CD-RW Audio

Implicit in CD-R and CD-RW is the ability to make digital copies of copyrighted works. Sony urges all users to record responsibly. Computer CD-R/RW drives write onto all CD-R and CD-RW media. But dedicated audio CD-R/RW recorders require media with a special code that identifies the discs for audio use.

CD-R Audio and CD-RW Audio are the only media that will record on CD-R/RW home audio recorders. However, the CD-R Audio and CD-RW Audio discs can write both data and music when used with personal computer CD-R/RW drives.

Specifically designed for use in CD-R/CD-RW home audio recorders.

	Media for CD Format Digital Audio	CD-R	CD-RW	CD-R Audio	CD-RW Audio
Recording Drives	CD-R/RW Drive	Yes	Yes	Yes	Yes
	CD-R/RW Audio Recorder	No	No	Yes	Yes
Read Drives	CD-R/RW Drive	Yes	Yes	Yes	Yes
	CD-R/RW Audio Recorder	Yes	Yes	Yes	Yes
	Multi-Read CD-ROM Drive	Yes	Yes	Yes	Yes
	Multi-Read DVD-ROM Drive	Yes	Yes	Yes	Yes
	CD-ROM Drive	Yes	No	Yes	No
	DVD-ROM Drive	Yes	No	Yes	No
	Audio CD Player	Yes	No	Yes	No

Compatibility for CD-format digital audio. CD-R/RW audio recorders can only record on dedicated CD-R Audio and CD-RW Audio discs.

A bright future

The experience of burning your own CDs can be personally and professionally gratifying. It's quite remarkable that end-users can now work with technology previously limited to an elite group of industrial users. Now that the market has expanded, the new generation of users needs simply to exercise a little care in the choice of media. If they do, the results can be spectacular.

Record Responsibly!

Before copying anything onto a CD-R or CD-RW disc, please be sure you are not violating copyright laws. Most PC software companies allow you to make a back up or archive copy of software. Check your software license agreement for specific details.

Trim

Background: Sony, Philips and the Compact Disc

Sony is in the ideal position to explain CD-R and CD-RW technologies because Sony and Philips invented Compact Disc in the first place. Sony introduced the first CD player in the United States in 1983. Sony and Philips soon extended the CD concept with the CD-ROM data disc. This was followed by CD-R, CD-RW, DVD-Video, DVD-ROM, DVD+RW and still additional formats — all of which depend on technology from Sony and Philips.

CDQ-74CN

And Sony continues to lead the way. We're a major presence in every link of the CD chain, from music CD recording, mastering and manufacturing to home, car and portable CD players to CD-ROM drives and Spressa™ CD-R/RW burners to the new Sony RCD-W1 CD/CD-R/CD-RW dual deck audio recorder to a full range of CD-R and CD-RW recording media.

Something's always new at the MSC website!

When technology moves this quickly, paper brochures can hardly keep up.
For the latest information, visit us at:

www.mediabysony.com

Comments? Questions?

If you'd like to share your thoughts, including information you'd like to see in future issues, we'd love to hear from you. You can write us at:

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