

Blu-Ray Technology

What is Blu-ray?

Blu-ray, also known as Blu-ray Disc (BD) is the name of a next-generation optical disc format. The format was developed to enable recording, rewriting and playback of high-definition video (HD), as well as storing large amounts of data. The format offers more than five times the storage capacity of traditional DVDs and can hold up to 25GB on a single-layer disc and 50GB on a dual-layer disc. For more general information about Blu-ray, please see our [What is Blu-ray?](#) section.

Why the name Blu-ray?

The name Blu-ray is derived from the underlying technology, which utilizes a blue-violet laser to read and write data. The name is a combination of "Blue" (blue-violet laser) and "Ray" (optical ray). According to the Blu-ray Disc Association the spelling of "Blu-ray" is not a mistake, the character "e" was intentionally left out so the term could be registered as a trademark.

The correct full name is Blu-ray Disc, not Blu-ray Disk (incorrect spelling)

The correct shortened name is Blu-ray, not Blu-Ray (incorrect capitalization) or Blue-ray (incorrect spelling)

The correct abbreviation is BD, not BR or BRD (wrong abbreviation)

Who developed Blu-ray?

The Blu-ray Disc format was developed by the Blu-ray Disc Association (BDA), a group of leading consumer electronics, personal computer and media manufacturers, with more than 170 member companies from all over the world. The Board of Directors currently consists of:

- Apple Computer, Inc.
- Dell Inc.
- Hewlett Packard Company
- Hitachi, Ltd.
- LG Electronics Inc.
- Matsushita Electric Industrial Co., Ltd.
- Mitsubishi Electric Corporation
- Pioneer Corporation
- Royal Philips Electronics
- Samsung Electronics Co., Ltd.
- Sharp Corporation
- Sony Corporation
- TDK Corporation
- Thomson Multimedia
- Twentieth Century Fox
- Walt Disney Pictures
- Warner Bros. Entertainment

What Blu-ray formats are planned?

As with conventional CDs and DVDs, Blu-ray plans to provide a wide range of formats including ROM/R/RW. The following formats are part of the Blu-ray Disc specification:

BD-ROM - read-only format for distribution of HD movies, games, software, etc.

BD-R - recordable format for HD video recording and PC data storage.

BD-RE - rewritable format for HD video recording and PC data storage.

There's also plans for a BD/DVD hybrid format, which combines Blu-ray and DVD on the same disc so that it can be played in both Blu-ray players and DVD players.

How much data can you fit on a Blu-ray disc?

A single-layer disc can hold **25GB**.

A dual-layer disc can hold **50GB**.

To ensure that the Blu-ray Disc format is easily extendable (future-proof) it also includes support for multi-layer discs, which should allow the storage capacity to be increased to 100GB-200GB (25GB per layer) in the future simply by adding more layers to the discs.

How much video can you fit on a Blu-ray disc?

Over 9 hours of high-definition (HD) video on a 50GB disc.

About 23 hours of standard-definition (SD) video on a 50GB disc.

How fast can you read/write data on a Blu-ray disc?

According to the Blu-ray Disc specification, 1x speed is defined as 36Mbps. However, as BD-ROM movies will require a 54Mbps data transfer rate the minimum speed we're expecting to see is 2x (72Mbps). Blu-ray also has the potential for much higher speeds, as a result of the larger numerical aperture (NA) adopted by Blu-ray Disc. The large NA value effectively means that Blu-ray will require less recording power and lower disc rotation speed than DVD and HD-DVD to achieve the same data transfer rate. While the media itself limited the recording speed in the past, the only limiting factor for Blu-ray is the capacity of the hardware. If we assume a maximum disc rotation speed of 10,000 RPM, then 12x at the outer diameter should be possible (about 400Mbps). This is why the Blu-ray Disc Association (BDA) already has plans to raise the speed to 8x (288Mbps) or more in the future.

What video codecs will Blu-ray support?

MPEG-2 - enhanced for HD, also used for playback of DVDs and HDTV recordings.

MPEG-4 AVC - part of the MPEG-4 standard also known as H.264 (High Profile and Main Profile).

SMPTE VC-1 - standard based on Microsoft's Windows Media Video (WMV) technology.

Please note that this simply means that all Blu-ray players and recorders will have to support playback of these video codecs, it will still be up to the movie studios to decide which video codec(s) they use for their releases.

What audio codecs will Blu-ray support?

Linear PCM (LPCM) - offers up to 8 channels of uncompressed audio.

Dolby Digital (DD) - format used for DVDs also known as AC3, offers 5.1-channel surround sound.

Dolby Digital Plus (DD+) - extension of DD, offers increased bitrates and 7.1-channel surround sound.

Dolby TrueHD - extension of MLP Lossless, offers lossless encoding of up to 8 channels of audio.

DTS Digital Surround - format used for DVDs, offers 5.1-channel surround sound.

DTS-HD - extension of DTS, offers increased bitrates and up to 8 channels of audio.

Please note that this simply means that all Blu-ray players and recorders will have to support playback of these audio codecs, it will still be up to the movie studios to decide which audio codec(s) they use for their releases.

Will Blu-ray discs require a cartridge?

No, the development of new low cost hard-coating technologies has made the cartridge obsolete. Blu-ray will instead rely on hard-coating for protection, which when applied will make the discs even more resistant to scratches and fingerprints than today's DVDs, while still preserving the same look and feel. Blu-ray also adopts a new error correction system which is more robust and efficient than the one used for DVDs.

Will Blu-ray require an Internet connection?

No, you will not need an Internet connection for basic playback of Blu-ray movies. The Internet connection will only be needed for value-added features such as downloading new extras, watching recent movie trailers, web browsing, etc. It will also be required to authorize managed copies of Blu-ray movies that can be transferred over a home network.

Will Blu-ray down-convert analog outputs?

No, Blu-ray players will not down-convert the analog output signal unless the video contains something called an Image Constraint Token (ICT). This feature is not part of the Blu-ray Disc spec, but of the AACS copy-protection system also adopted by HD-DVD. In the end it will be up to each movie studio to decide if they want to use this "feature" on their releases or not. The good news is that Sony, Disney, Fox, Paramount, MGM and Universal have already stated that

they have no intention of using this feature. The other studios, which have yet to announce their plans, will most likely follow suit to avoid getting bad publicity. If any of the studios still decide to use ICT they will have to state this on the cover of their movies, so you should have no problem avoiding these titles.

Will Blu-ray support mandatory managed copy?

Yes, mandatory managed copy (MMC) will be part of the Blu-ray format. This feature will enable consumers to make legal copies of their Blu-ray movies that can be transferred over a home network. Please note that "mandatory" refers to the movies having to offer this capability, while it will be up to each hardware manufacturer to decide if they want to support this feature.

When will I be able to buy Blu-ray products?

If you live in the US, you will most likely have to wait until June 25, 2006 when Samsung will introduce their Blu-ray player (was recently pushed back from May 23, 2006). Pioneer and Sony plan to introduce their respective Blu-ray players in July. While we've heard very little about the launch plans for the European market, we expect it to follow shortly after the US (some products might launch earlier).

What will Blu-ray products cost?

As with any new technology the first generation of products will likely be quite expensive due to low production volumes. However, this shouldn't be a problem for long as there is a wide range of Blu-ray related products (players, recorders, drives, writers, media, etc) planned, which should help drive up production volumes and lower overall production costs. Once mass production of components for Blu-ray products begins the prices are expected to fall quickly.

According to the Blu-ray Disc Association, the overall cost of manufacturing Blu-ray Disc media will in the end be no more expensive than producing a DVD. The reduced injection molding costs (one molding machine instead of two, no birefringence problems) offset the additional cost of applying the cover layer and low cost hard-coat, while the techniques used for applying the recording layer remain the same. As production volumes increase the production costs should fall and eventually be comparable to DVDs.

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