



Burn Baby Burn

CD & DVD Burning

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adult education

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All About CDs

Mainly sourced from <http://www.cdrfaq.org>

CD-R and CD-RW?

CD-R is short for "CD-Recordable". Recordable CDs work just like standard CDs. The advantage of CD-R over other types of optical media is that you can use the discs with a standard CD player. The disadvantage is that you can't reuse a disc.

A related technology called CD-Rewritable (CD-RW) allows you to erase discs and reuse them, but the CD-RW media doesn't work in all players. CD-Rewritable drives are able to write both CD-R and CD-RW discs but cannot erase a CD-R CD.

All CD recorders can read CDs and CD-ROMs, just like a standard CD-ROM drive.

Are they identical to normal CDs?

CD-ROMs and music CDs you commonly find in stores are pressed from a glass mould. CD-Rs are burned with a laser. They may look different (often green, gold, or blue instead of silver), they're less tolerant of extreme temperatures and sunlight, and they're more susceptible to physical damage.

While they're not physically identical, they work just the same. Some CD players and CD-ROM drives aren't as good at reading CD-R and CD-RW discs as they are at reading pressed CDs, but by and large they work just fine.

You can't record on pressed discs, so you might as well throw out all those freebie CD-ROMs you've been accumulating. You also can't record on DVD media, not even DVD-R and DVD+RW, unless your drive explicitly supports the DVD formats. You have to buy blank CD-R or CD-RW media.

The CD-ROMs you produce will play in ordinary CD-ROM drives, and the audio CDs you create will work in your home or car CD player.

Writing to CD-Rs and CD-RWs requires a CD recorder. You can't write CDs with an ordinary CD-ROM drive.

Can I use it to copy my CDs?

Yes, both audio and data CDs can be duplicated. You can even create audio CDs that are compilations of other audio CDs (perhaps a personal "best of" disc).

Bear in mind that most CDs are protected by copyright laws. There are small size differences between recordable CDs and pressed CDs, so in some cases there might not be enough space on the recordable CD. In many cases you can leave off one track or one folder to make it fit.

How much can they hold?

Commonly available blanks hold either 74 or 80 minutes of music, which works out to 650MB and 700MB of data, respectively.

Can I just copy files onto a CD-R like I would to a floppy?

Yes and no. The process can be a bit more involved than that, and requires software that (usually) comes bundled with the drive.

With "packet writing" software, and a recorder that supports it, you can treat a CD-R or CD-RW disc like a floppy. On a CD-R you can only write to each part of the disc once, so deleting files doesn't free up any space. There are other limitations as well.

With more traditional software -- necessary if you want broad compatibility -- you usually end up writing everything to the disc all at once. When you're doing the writing you can't interrupt the drive, and you can't reclaim the space you've used. If you want to write your files in smaller sessions, you lose a fair bit of space every time you stop and start again.

Can I download MP3s from the Internet and make an audio CD?

You can download MP3s, write them to a CD, and play it in anything that handles audio CDs. In fact, many of the popular CD recording programs will decode the MP3s for you.

It's also possible to take songs from a CD and convert them to MP3s for use in an MP3 player.

What is a DVD?

DVD is a bigger, faster CD that can hold cinema-like video, better-than-CD audio, still photos, and computer data. It has replaced CDs, is well on the way to replacing videotape and will eventually replace audio CD and CD-ROM. DVD became the most successful consumer electronics product of all time in less than three years of its introduction. Where-as a CD-ROM holds up to 750MB, a single sided DVD can hold 4.7GB (approximately 4700MB) of data.

What do the letters DVD stand for?

All of the following have been proposed as the words behind the letters DVD.

- Digital video disc (the original meaning proposed by some of DVD's creators)
- Digital versatile disc (a meaning later proposed by some of DVD's creators)
- Nothing

And the official answer is? "Nothing." The original acronym came from "digital video disc.". The DVD Forum (www.dvdforum.org) decided in 1999 that DVD, as an international standard, is simply three letters. After all, how many people ask what VHS stands for? (no one agrees on that one either.)

What's a dual-layer disc? Will it work in all players?

A dual-layer disc has two layers of data, one of them semi-transparent so that the laser can focus through it and read the second layer. Since both layers are read from the same side, a dual-layer disc can hold almost twice as much as a single-layer disc, typically 4 hours of video. Many discs use dual layers. When the laser pickup head reaches the end of the first layer it changes focus to the second layer and starts moving back toward the center of the disc. The layer change can occur anywhere in the video; it doesn't have to be at a chapter point. There's no guarantee that the switch between layers will be seamless. The layer change is invisible on some players, but it can cause the video to freeze for a fraction of a second or as long as 4 seconds on other players. The "seamlessness" depends as much on the way the disc is prepared as on the design of the player.

Is CD audio compatible with DVD?

Yes. All DVD players and drives will read audio CDs.

On the other hand, you can't play a DVD in a CD player. (The pits are smaller, the tracks are closer together, the data layer is a different distance from the surface...) Also, you can't put CD audio data onto a DVD and have it play in DVD players.

Is CD-ROM compatible with DVD-ROM?

Yes. All DVD-ROM drives will read CD-ROMs. Software on a CD-ROM will run fine in a DVD-ROM system.

However, DVD-ROMs are not readable by CD-ROM drives.

How long do DVDs last?

DVDs are read by a laser, so they never wear out from being played since nothing touches the disc. Pressed discs (the kind that movies come on) will probably last longer than you will, anywhere from 50 to 300 years.

Expected longevity of dye-based DVD-R and DVD+R discs is anywhere from 20 to 250 years, about as long as CD-R discs. Some dye formulations (such as phthalocyanine and azo) are more stable and last longer, 100 years or more, compared to 20 or 30 years for less stable dyes.

The phase-change erasable formats (DVD-RAM, DVD-RW, and DVD+RW) have an expected lifetime of 25 to 100 years.

In all cases, longevity can be reduced by poor quality. Poor quality pressed DVDs may deteriorate within a few years, and cheap recordable DVDs may produce errors when recording or may become unreadable after a while.

For more info see [Lifetime of KODAK CD-R Ultima Media](http://www.kodak.com) on the internet (www.kodak.com).

For comparison, magnetic media (tapes) last 10 to 30 years; high-quality, acid-neutral paper can last 100 years or longer; and archival-quality microfilm is projected to last 300 years or more. Note that computer storage media often becomes technically obsolete within 20 to 30 years, long before it physically deteriorates. In other words, before the media becomes unviable it may become difficult or impossible to find equipment that can read it.

Can I play DVD movies on my computer?

Yes, if your computer has the right stuff. Almost all Windows and Mac OS computers with DVD drives come with software to play DVDs.

What are the features and speeds of DVD drives?

A 1x DVD-ROM drive provides a data transfer rate of 1.321 MB/s with burst transfer rates of up to 12 MB/s or higher. The data transfer rate from a DVD-ROM disc at 1x speed is roughly equivalent to a 9x CD-ROM drive (1x CD-ROM data transfer rate is 150 KB/s). DVD physical spin rate is about 3 times faster than CD (that is, 1x DVD spin ~ 3x CD spin), but most DVD-ROM drives increase motor speed when reading CD-ROMs, achieving 12x or faster performance. DVD-ROM drives are available in 1x, 2x, 4x, 4.8x, 5x, 6x, 8x, 10x, and 16x speeds, although they usually don't achieve sustained transfer at their full rating. The "max" in DVD and CD speed ratings means that the listed speed only applies when reading data at the outer edge of the disc, which moves faster. The average data rate is lower than the max rate.

Likewise, DVD recordable drives have steadily increased in write speed. 16x DVD writers began to be widely available in 2004. Note that recordable discs have different speed ratings.

Current thinking is that DVD drive speeds have topped out at 16x, since disc wobbling and other physical factors become a problem at faster speeds.

In order to maintain constant linear density, typical CD-ROM and DVD-ROM drives spin the disc more slowly when reading or writing near the outside where there is more physical surface in each track. This is called CLV; constant linear velocity. Some faster drives keep the rotational speed constant and use a buffer to deal with the differences in data readout or writeout speed. (This is called CAV, constant angular velocity.) In CAV drives, the data is read or written fastest at the outside of the disc, which is why specifications often list "max speed."

Note: When playing movies, a fast DVD drive gains you nothing more than possibly smoother scanning and faster searching. Speeds above 1x do not improve video

quality from DVD-Video discs. Higher speeds only make a difference when reading computer data, such as when playing a multimedia game or when using a database.

DVD-R, DVD-RAM, DVD-RW, DVD+RW, and DVD+R?

There are six recordable versions of DVD:

DVD-R for General, DVD-R for Authoring, DVD-RAM, DVD-RW, DVD+RW, and DVD+R. DVD-R and DVD+R can record data once, like CD-R, whereas DVD-RAM, DVD-RW, and DVD+RW can be rewritten thousands of times, like CD-RW. DVD-R was first available in 1997. DVD-RAM followed in 1998. DVD-RW came out in Japan in 1999, but was not available in the U.S. until 2001. DVD+RW became available in 2001. DVD+R was released in 2002.

Recordable DVD was first available for use on computers only. Home DVD video recorders appeared worldwide in 2000.

DVD-RAM is more of a removable storage device for computers than a video recording format, although it had become widely used in DVD video recorders because of the flexibility it provides in editing a recording. The other two recordable format families (DVD-R/RW and DVD+R/RW) are essentially in competition with each other. They ended up coexisting. There are many claims that one or the other format is better, but they are actually very similar. In 2003 many companies began making drives that could record in both "dash" and "plus" format.

Compatibility problems with recordable DVD formats

None of the writable formats are fully compatible with each other or even with existing drives and players. In other words, a DVD+R/RW drive can't write a DVD-R or DVD-RW disc, and vice versa (unless it's a combo drive that writes both formats). As time goes by the different formats are becoming more compatible and more intermixed.

Modern "combo" drives can write to almost all disc formats (DVD-R, DVD-RW, DVD+R, DVD+RW, CD-R, CD-RW). Older drives write only their DVD format, so you may have to get DVD+R/RW discs for a DVD+RW drive and DVD-R/RW discs for a DVD-RW drive.

Very roughly, DVD-R and DVD+R discs work in about 85% of existing drives and players, while DVD-RW and DVD+RW discs work in around 80%. The situation is steadily improving. In another few years compatibility problems will mostly be behind us, just as with CD-R (did you know that early CD-Rs had all kinds of compatibility problems?).

What does 2x, 4x, 16x, and so on mean on recordable discs, and which one should I use?

Recordable discs come in different speed ratings (2x = twice standard write speed, 8x = eight times standard speed, and so forth). The speed ratings of blank discs match the

speed ratings of drives (see [4.2](#)). When faster drives become available, new discs are designed to work with the new drives as well as older drives. This means you should use discs that are rated at or above the speed of your drive. For example, if you have a 4x drive you should use 4x or faster discs, not 1x or 2x.

Almost all home DVD video recorders use 1x drives, so any speed of discs should work.

Why can't I play movies copied to my hard drive?

Almost all movies are encrypted with CSS copy protection (see [1.11](#)). Decryption keys are stored in the normally inaccessible lead-in area of the disc. You'll usually get an error if you try to copy the contents of an encrypted DVD to a hard drive. However, if you have used a software player to play the movie it will have authenticated the disc in the drive, allowing you to copy without error, but the encryption keys will not be copied. If you try to play the copied VOB files, the decoder will request the keys from the DVD-ROM drive and will fail. You may get the message "Cannot play copy-protected files".

What do I burn on a CD or DVD?

There are different reasons you might like to burn a CD:

- 1) Audio CD with your own compilation – regular audio CD
- 2) CD with MP3 compilation – can store 100+ songs on a CD to be played on compliant equipment
- 3) Temporary/Permanent storage – data CDs up to 800MB
- 4) Data Backups – data CDs up to 800MB
- 5) Copies of CDs you wish to keep safe

There are different reasons you might like to burn a DVD:

- 6) Video DVD with your own movies – regular video DVD
- 7) Temporary/Permanent storage – single sided DVDs store up to 4.7GB
- 8) Data Backups – single sided DVDs store up to 4.7GB
- 9) Copies of DVDs that are not copyright protected that you wish to keep safe

Music CD/DVDs

The first thing required is to obtain music. This can be done by 'ripping music' from CDs. This can be done with a large range of software, including Microsoft Media Player which is included with Windows XP. Music can also be downloaded for free or for money, depending on source. It is important you are aware of copyright restrictions as it is illegal to copy/download some music!

Typically ripped music ends up in MP3 format, a compressed format. You can change the quality (compression) of these files, and when burning a compilation of MP3s it is important the tracks you wish to save on CD/DVD are of approximately the same volume and quality. There are lots of different encoding standards, find one you like and stick to it. Before burning your tracks it is best to normalise all tracks. Some programs are made to do this for your tracks and some recorders will automatically do it. If one track is recorded louder or softer than another track you will find yourself running to the volume controls regularly!

Once you have your music ready and prepared you are ready to burn them. Open your favourite burning program, locate the directory where you copied the tracks you want, and burn baby burn! If you burn the MP3s as they are only computers or certain MP3 enabled players can play them. You can fit an awful lot of music on a CD or DVD, much more than on a regular audio CD. Some software can make your compilation into a true Audio CD. 'Closing' the CD or DVD is generally done automatically. Once the session or disc is closed it can be read by other computers and equipment.

Data CD/DVDs

Data is a lot easier to record than music or video. When you insert a burnable CD or DVD the Windows Operating System will usually prompt you to carry out an action. Choose the one that corresponds with your intentions. When the CD/DVD is full you need to burn the data or/and complete the CD.

Doing backups on CD or DVD is handy, the first backup would need to be a total backup, say you do that on Sunday nights. Total backups take the longest. Then every afternoon you could carry out a differential backup on the same DVD which only adds the changed files. This way you can have say 3 DVD-RWs, one per week and every third week you erase the one that is 3 weeks old. Backup software can compress your data neatly and schedule your backups. Remember your data might not fit on one DVD, but your backup software will advise you of that!

Doing an occasional backup of all your precious files is a good exercise. Open up your DVD burning software and place all your important files on the 'source' window till the space indicator tells you the media is almost full, and press Burn. Try not filling up your DVD/CDs to 100% capacity. Best is to keep 10% spare just in case! It also makes the media more reliable as for some reason more errors are created on the edge of the medium. Another hint to make more readable media is to burn using speeds lower than the maximum! If your burner supports 16x and your DVD-R is rated at 8x, do not be afraid to burn at 4x for optimum results! You might not even notice the time difference in burning!

Closing and Sessions?

The computer is a lot more versatile than your audio/video equipment. A CD is a medium that has a file system that indicates the entire structure of the media. When you are done writing to your DVD/Cd you need to finalise or close the media to ensure it is readable by other computers and equipment. Typically a multi-session CD

you created will only play the first session in your car-stereo or lounge room CD player.

Video DVDs

Video on a DVD you rent from the shop has encryption on it which stops you from copying it. Copying it in most cases is illegal. You can find software on the internet that will decrypt them for copying. If you record video from a TV-card or have video from your camcorder or camera it will typically be in AVI format or some other digital form and take up huge amounts of data depending on the quality. 10Gb per hour is not unheard of. This does not fit on one DVD and fills your HDD up real fast!

In order to burn a video DVD that you can show on a commercial DVD player needs to be in a special format, and will be specifically PAL or NTSC to begin with. You can burn video DVD using most DVD burning software. You import the clips and create a visually appealing menu to play them, and then you burn the DVD.

DVD Burning Media Suites usually include DVD Burning, DVD Authoring, DVD Editing, & DVD Copy applications in one bundle. Examples are Roxi Media Creator, Pinnacle Studio,

Slide Shows

Creating Slideshows on CD or DVD is also a small art. Typically a Slide Show is designed for computers. Many imaging software titles, such as Picasa, will have a slideshow burning option. Most of these make a computer readable slideshow, not a CD/DVD that is ready for your home theatre system!

Just saving JPG picture files on your computer works for many domestic DVD players, but the slide show is very limited and very awkward in most cases. A CD/DVD with JPG files is not regarded as a slideshow, merely a collection of images burnt on CD/DVD that some home DVD players can 'display' in the form of a slideshow.

Special software is required to make VCDs (Video CDs). VCDs cannot be read by all DVD players, but most will! Making a video DVD from your slideshow is normally the best option. To do this you use a DVD Burning Media Suites just as you do for home movies. Typically it allows you to import the pictures, make a transition between slides and set slide duration. You can add titles to the slides and make an intro and a credit page. Usually you can also have an audio track and a narration track that you can speak into a microphone.

