

## A Brief Guide to CD/DVD Burning by Laurence Fenn

CD/DVD Writers are now common, and this paper will try to explain the differences between the formats and the types of disc you can burn, from audio compilations to data backup.

CD burning uses CD-R or CD-RW discs. CD-R stands for *CD-Recordable*. Commercial audio and PC game CDs that you can buy are pressed from a mould, whereas the ones you create with a CD-R drive are burned with a laser. CD-RW stands for *CD-ReWritable*. The difference is that with CD-R you can only write to it once and when the disc is full, that's it. With CD-RW, data can be erased and rewritten. There are two other terms that are relevant to CD burning, *Multi-session recording* and *open/closed discs*. Multi-session recording is the ability to add data to a disc over a period of time rather than all in one go. A CD has a capacity of 650MB – 700MB of data, and with multiple sessions you can write smaller amounts of data. But each 'session' also takes some additional space, so you will not fill the capacity of the disc if you write data in this way. You need a multi-session drive to read multi-session CDs, and that is most CD-ROM drives but not standard audio CD players. They only look at the first session on a CD and hence cannot read multi-session discs.

When a CD is full or you do not want to write any more data to it, you must 'close' or 'finalise' the disc. This prevents any more sessions being written to it and allows a standard CD-ROM drive or audio player to read the disc.

When a laser burns a CD, it must do it in one continuous stream, and to do this it must be fed a constant supply of data. To help do this, CD recorders have a buffer which stores the data read from the hard drive (or another CD if doing CD-to-CD recording) and feeds it to the laser. If the system is unable to supply data quickly enough, the laser runs out of data to write and a buffer under run error occurs. This usually results in a faulty disc that cannot be used.

DVDs also have a write once and rewritable standards, but they also have two different standards for writing the data. The write once discs are DVD+R or DVD-R, and some DVD players will only read one format. The rewritable discs are DVD+RW and DVD-RW. There is a DVD-RAM format, but this is mainly used for data, and not really suited to video. Using RW is useful for testing, as you can burn a disc to see if it will work on your player (or test the contents) and wipe it and start again. If you intend to create DVD-Video discs to play on your DVD player, you will need to check if they can read DVD-R or DVD+R discs. New DVD Writers can write both formats, depending on the disc you use.

The last item you may notice about recordable discs is that they come with 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. If you use a 4x disc in your 32x CD burner, you will only be able to write the data to the disc at 4x. If you are writing 60 minutes worth of audio, then writing at 4x will take 15 minutes. With some discs you can write at a faster speed, but the disc may be prone to errors. If you have trouble writing a disc at a high speed, reducing the speed may help. Almost all home DVD video recorders use 1x drives, so any speed of discs should work with them.

When you buy a CD/DVD writer, it will invariably come with some software to enable you to burn your own discs. Popular writing software includes Nero and Roxio. Both have wizards to help you through the process of creating a disc. There are various types of disc that you can burn, and most are compatible with DVD players.

### Audio CD

An audio CD can be made from tracks on your hard drive (usually in wav format, but programs will convert from mp3, wma and other formats). All you do is browse your PC for the audio files and drag them into a compilation or project to burn to disc. The software usually tells you how much space you have used, and by default, add a two second gap between each track, but this can be removed. You can create compilations by copying tracks from other CDs (known as ripping). With certain types of audio discs where the tracks merge seamlessly, like any of the Jean Michel Jarre albums, the gaps have been removed completely. To copy discs like this you would need to need to do a one to one copy of the original. If you wanted to only use certain tracks, you would have to edit the tracks, or merge the tracks yourself, which is usually possible within the burning software.

### **Enhanced CDs**

Many CD singles come with extra material that you only see when you use the disc in a PC. These are enhanced CDs, and are created by burning the audio in the first session and then the PC data in a second session. As audio CD players only see the first session, the disc will play like a normal CD if you play it in a CD player. As CD drives in PCs can read multi-session discs, the PC data on the disc (which will usually have an autorun feature, so the program starts automatically) will be seen by the drive. The extras usually include a video of the single, or pictures of the group/artist. Some discs have included software to remix the single, or create a custom video for the song.

### **Mp3 discs**

This format takes a lot less space than wav files, so you can fit several albums worth if you save your music in this format. Audio CD players can't read these type of discs, but modern DVD players can as the format is similar to the audio content of a DVD-Video, but you should check your DVD player manual first. Whereas an audio CD is 74 or 80 minutes (there are 99 minute CDs, but they don't conform to the original standard and may not play on some machines) an mp3 disc could contain many hours of music, depending on the compression used on the files. You could put all your favourite music for a party and play the CD in your DVD player, although the order in which they are played will depend on how the DVD player handles the disc.

### **Data CD**

Mp3 discs are effectively data discs, but you can burn any data on your PC to a disc. The 74-minute discs hold 650MB, but the discs usually hold 80mins, or 700MB. A DVD can hold 4.7GB of data (although it's really a bit less than that). Newer dual layered discs can hold 9.8GB, but these are very expensive in comparison, and require a dual layered DVD writer. To make these discs usually involves dragging the data from an explorer like interface to a directory structure on the disc. This is the easiest type of disc to make, and can be used for backup of your data, whether it's documents, pictures, sound files or anything on your hard disc.

### **JPG**

Some DVD players can play pictures saved in this format on a regular data disc. This can be useful as you can read the pictures on the PC as well. The size of the pictures can be larger than the standard TV resolution (720x576 pixels) so these discs will take a while to display the pictures. Some programs have the option to save the pictures in this format when you create a Video CD (see below).

### **Photo CD**

This format by Kodak holds pictures in four different sizes for each photo, and can be produced direct from the film, when processed. As jpg and video become more popular, this format is less common, although many DVD players can read them. PC graphic editing programs can usually read PCD files.

### **Photo**

All of the video formats (VCD, SVCD and DVD Video) support pictures at full screen resolution. Music can be added as a soundtrack, with transitions for the pictures. These discs are saved as a video, and the images cannot be loaded individually on a PC. This is sometimes known as a picture CD.

### **Video CD**

VCD is the first format that was available to burn video on CD. The video is quarter screen size (352x288 pixels on a UK PAL disc) and can contain about an hour of footage. The picture quality is about the same as a standard VHS tape. You can use simple menus, but the number pad on your remote usually accesses tracks. Most modern DVD players can play these, but you should check your manual. When creating picture slideshows with transitions on a video CD, the software may offer the option to store the original pictures on the disc as well.

### **SVCD**

This is a higher quality format, and the video is square (480x480 pixels is one standard, but there are a few different sizes). When the video is played back, the picture is squashed into the normal size, and produces better pictures. The audio is 48KHz, as opposed to 44KHz of VCD (and normal audio CDs). As the picture is larger and the audio takes more room, you can only get around 30 minutes of footage on the disc.

## **DVD-Video**

Using the normal single layered discs, you can put two hours of video on these discs, with menus, subtitles, text screens, and different languages. The quality of the video (within the parameters of the DVD format) can vary, so can the amount of video you can fit on a disc. A high quality setting will result in an hour's worth of video, whereas a low setting can have six hours of video. The format is 720x576 pixels on a UK disc, and again the audio is 48KHz. You can put VCD and SVCD files on a DVD to get more footage, if the audio is at the right format and the software you use to create the discs allows it. Newer dual layered discs can hold twice as much video, but not only do they need a dual layered writer to create them, but the software to cope with the larger disc. Often commercial dual layered discs will have a note saying that a short delay may occur when the DVD player changes layers. These discs are mastered so the change happens at the end of scene, or where it is not noticeable. The same care should be taken when creating your own dual layered discs for video.

## **Backup**

As you can burn any PC data to a CD or DVD, it's perfect for backup. You can put your photos, videos, documents, sound files, onto disc and keep it safe in case your hard disc crashes. Many back up programs have an option to write to a CD/DVD. I keep separate folders of pictures, videos, sounds and stuff downloaded from the internet, and when I have 700MB of data (or 4.7GB for a DVD) I backup the data to disc, delete the contents and relabel the folder. There are programs available that can report how much data is in a folder, although you can right hand click on the folder in Explorer and choose properties, but none that I know of that will then write the data and relabel the folder. Some disc image programs can be used to back up, by making an exact copy of a drive, and burning it to disc (or several if it doesn't fit). If your machine does not start up, you can usually start the disc image program and restore the data.

## **Bootable CDs/DVDs**

If your PC does not start up correctly, or maybe has a virus, you can use the Operating System disc to boot up your PC to try and repair it. With Anti virus discs, you can start your PC and run a scan. These discs are bootable, and work the same way that a floppy disc can be used to start up the PC. You can create your own start up disc by using a floppy disc (or an image file of a bootable floppy disc if you do not have a floppy disc drive) and selecting the bootable option in your CD/DVD burner software. Your PC should also check the CD or DVD drive before the hard disc. The complete process is quite complex and beyond the scope of this paper.

## **Dual Layered DVD Discs**

As mentioned before, you can write 700Mb on a CD, or 4.7Gb on a single layer disc. Newer drives can write dual layered discs, which are very expensive at the moment. The reason for this is that dual layered discs would enable you to copy a commercial DVD perfectly, with the right software. Some programs are available that will copy a dual layered disc to a single layered disc, by recompressing the video or removing items on the disc. All DVD films have encryption to prevent you from copying them, but many programs decrypt them. Macro vision, which was designed to stop people copying VHS films using two video recorders, is also added to DVD discs, but this can be bypassed when you recode the picture.