

# PC Audio : Digital to Digital

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Normally most of the PC users copy their audio CD's with a normal CD-Rom player and CD-ROM Burner, and sometimes use a program to 'grab', or to extract the

audio data. While this method is efficient enough for most people, some of the audio data will be lost resulting this lower quality copy method. Most people don't care too much about the quality of their audio copies, and maybe from their point of view, they're right. But for sampling you need the highest quality, and sometimes if you sample separate sounds from an (copied) AUDIO CD, the quality is really bad and so not suitable for sampling. This is due to the differences between how (normal) DATA and (audio) DATA are treated when copied. These differences are perhaps difficult to explain, but here I'll give it a try.

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## NORMAL AND AUDIO DATA

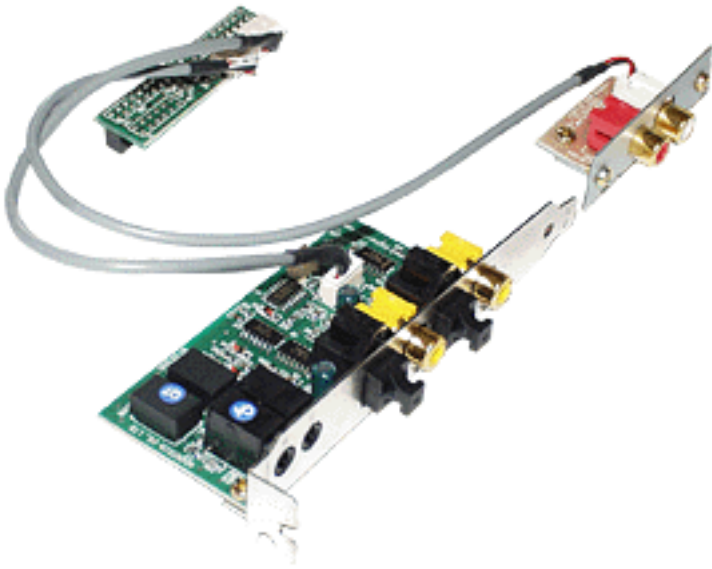
**NORMAL DATA** stays exactly the same if you copy it or burn it on CD. Because the process of copying is entirely digital, the bits and bytes will just be duplicated without any loss of data. Only in case of failing media or hardware loss of data can occur. **AUDIO DATA** however, is not treated the same. Audio data, when played with a CD-player, or extracted, and then copied, is modified and therefore not exact data. This is because this method is not entirely digital. First, the digital data is converted through a D/A converter, to make it suitable for your speakers. Then, this analogue data is converted again, through an A/D converter. These two conversions alone can already result in loss of quality. Without going through the painstaking process of explaining the differences between analogue and digital audio, I think it's safe to say that CD audio (16 bits 44.1 KHz), just isn't sufficient enough to create a natural (analogue) sound. Digital audio resembles analogue audio good enough for the untrained ear, but it's still different. A sine wave will be chopped into square waves and therefore some harmonics will be lost, the loss of quality can become audible. To overcome part of this problem and make the sound more natural, or analogue sounding, an **AUDIO CD-player** uses **OVER-SAMPLING** to reshape those squared curves into more natural, sine waved shapes (see picture). Also, **AUDIO CORRECTION** filters are applied in order to correct errors (such as not correctly read data resulting in clicks and pops) and to correct or enhance the harmonics of the sound. This however, is a very complicated process, and has to be done almost real-time. In general, the better the audio correction and over-sampling filters and A/D D/A converters, the more expensive audio CD-players are. But they read even damaged CD's better and faster and so they provide a better sound quality.

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## EQUIPMENT AND TECHNIQUE

Now it's time to explain some of the differences in quality of techniques and equipment. Stand-alone, professional audio players and recorders are solely designed for one task: playing and/or recording audio. Depending on the quality of DA/AD converters, oversampling and audio correction filters, the copy can even be better than the original. This is possible because you can have the digital audio signal corrected twice. Once by the CD-player itself and a second time by the CD-recorder. In some occasions, even errors that have occurred during the production of an audio CD can be corrected this way. Some cheaper (stand-alone) audio recorders can only use special (consumer only) audio CD's which are copy-protected. With these CD's, it's not possible to create a copy from a copied disc. Also, these discs are more expensive but also of better quality than the normal data CD's (also suitable for recording audio data, but for better result use audio CD's). Most PC CD-ROM players / burners are more for general purpose. They are of a far lesser quality considering hardware, and generally the recorders don't have audio correction filters and over sampling. Therefore by coping disk to disk on a PC will give a lesser quality of audio CD than on a special audio set. Because the quality of the copy mainly depends on the quality of the CD player and recorder (and it's audio correction filters), the conclusion is that the best way to copy audio CD's is to use a stand-alone, professional CD player and recorder. The most important things to take into account when buying an audio CD player or recorder are: it should have at least 16 times over-sampling and an OPTICAL or COAXIAL DIGITAL output/input with audio correction. (AKAI uses coaxial). Of course you need to connect the Player and the Recorder with a special digital cable. In case of Coaxial I/O you need a Now-Noise cinch cable of the best quality, in case of an Optic I/O, you will find a lot of different quality in fibre cables. The real ones are quite expensive.





## PC & AUDIO DATA

If you want to do it with your PC equipment, the **DIGITAL-TO-DIGITAL** technique is the best way to copy audio CD's or record samples with a minimum of quality loss. The best thing to do is to buy one of the best **AUDIO** players (external with digital out connector) and the best burner for your PC (in my opinion a Plextor). Also buy a good quality PCI Soundcard with a digital in bracket. In order to create digital-to-digital copies, always connect the audio CD player's digital output with the digital input of the PC audio card. Now you can record samples or

stream the entire audio CD digitally to your PC without any loss of quality. The best way to record and store your samples, is to record them in a sample-program like WaveLab and save them as a wave (.wav) file. Because a .wav file is treated as normal data when copied, you can record it on CD without any loss. Also data for audio CD's can record in wavelab and saved as .WAV, later burned in NERO to audio CD. Some other tips to avoid quality loss: buy the best CD's (in my opinion TDK). Restart your computer and make sure no other programs are running. Also reducing the burning speed will help: 1 x speed will give the highest quality. The higher the speed the more quality loss you will have due to read-faults. Also SCSI player & recorder give better results when recording and copying audio CD's. And of course a high-end (fast) computer will help!

Success with copying and sampling.....MNX2010....March 2003 (corrected by JB03)



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**THANKS TO DOC BENI & JB03 FOR SUPERVISION**

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