

Burning harddisk backups with Nero

Installing PC operating systems is often a long and heavy task, that needs to be done if a new PC is to be configured or reconfigured (for example after a harddisk head crash has occurred). But installing the operating system is mostly not enough. The drivers for the specific PC hardware have to be installed, the network needs to be configured and the required applications need to be installed. The installation of several operating systems will take even longer.

Warning : written files can not be taken as the basis of a backup, as it may be difficult or even impossible to start the operating systems after having restored them. One of these difficulties is caused by filename limitations of DOS (only 8+3 filenames are allowed) or by file flags (for example hidden system or write protection), that are not correctly restored. Some operating systems may also assume files to be written at certain sector positions and thus, may not work if these files are copied at another position of the harddisk. Another problem could be that the backup program may be unable to read the filesystem that should be backed up. For example Windows NT4 cannot read FAT32 partitions without special drivers. Thus, in such cases, you will not be able to create any backup at all.

Nero's method to write harddisk backups works by storing harddisk sectors instead of files. That means a Nero backup contains all sectors of a harddisk or a partition. The advantage of such a method is that any operating system and file system can be backed up and that the backup will be fully functional and configured if it has been restored. The disadvantage of the Nero backup strategy is that there is no way to restore single files from the backup. The Nero restore program will always overwrite harddisks and/or partitions in their entirety.

Partitions and harddisk structure

It is worth writing about these harddisk internals here, because of the limitations of the PC BIOS and the harddisk structure, which also influence the options of Nero's backup restoration program.

A harddisk must contain partitions to be usable by an operating system (for example Windows 98, Windows NT, Linux, OS/2 and so on). Each partition uses an associated file system (for example FAT32, FAT16, NTFS, HPFS, Linux ext2fs and so on), that can be accessed by one or more operating systems. Under Windows, every accessible partition will get a drive letter (for example „C:“), whereas inaccessible partitions do not have any.

There are two different kinds of harddisk partitions on an IBM PC compatible computer's harddisk. The so called primary partitions have a privileged status, because many operating systems can be booted only from a primary partition. Each harddisk may contain up to 4 primary partitions. The other type of partitions are called extended partitions. In theory, there is no limitation in the number of extended partitions on a harddisk. However, as written above, many operating systems cannot be started from this kind of partitions. That is why these partitions are mostly used to store user data only.

There are further restrictions caused by historic design limitations. The PC BIOS addresses harddisk sectors by the so called CHS (cylinder-head-sector) addresses. In the early days of PCs,

harddisks were really built up that way, but later on, this way of addressing was only used to keep the operating systems compatible. Unfortunately, there is no way to address large harddisks (more than 8GB to be precise) with CHS addresses. The so called BIOS extensions must be used to access large harddisks. Of course these BIOS extensions are available only for new mainboards. These extended BIOS functions address harddisks simply with block numbers (LBA, logical block address). As you will probably expect it, most operating systems use the old CHS addressing methods in their early boot phases. This means that you cannot boot these operation systems from partitions, that are completely or partially behind the 8GB limit. Some errors in boot loaders prevent other operating systems from booting off a partition beyond the 2GB border.

How to create a harddisk backup with Nero

You start to create a harddisk backup by selecting the menu command „File“->“Burn HD backup“. A sequence of dialogues will appear, showing some information about how the Nero harddisk backup works. You will also be asked to create a bootable floppy disk or CD, that you will need to be able to start the Nero backup restoration DOS program. That means you will need a bootable floppy or CD, that contains DOS drivers for your CD ROM drive to restore the backup.

Nero now displays the backup selection dialog. You can choose which harddisk and which partition you wish to backup. The dialog box will display the partitions of the selected harddisk together with their drive letters, if they can be automatically determined by Nero. The entries of some partitions will probably have a red warning sign at their leftmost position. That means, that the filesystem on this partition is currently in use. This might be the case, because there are open programs or files on this volume. Another typical reason for a busy file system may be, that it contains the active operating system.

Unfortunately, sector reading from active file systems is a risky thing to do, because the contents of the opened files is undefined. Parts of the file may already be present in the operating system's cache, but not yet stored physically on harddisk. That means, that these parts of the open files cannot be read by sector reading functions and would get lost during the backup! **That's why ahead strongly recommends, not to backup active file systems!**

Nero will allow backup of active filesystems anyway, because many PCs are configured in such a way, that they contain only one big harddisk partition and one operating system. Thus, not allowing such active filesystem backup would prevent all these users from making any other kind of backup, which would be a shame for them.

A click on the „OK“ button closes this dialog box. In some cases, you will see a warning, that reminds you of the fact, that not every file systems can be restored on another harddisk. This message will pop up if Nero cannot reorganize one or more filesystems to make them work properly on another harddisk. Nero currently supports the file systems **FAT16**, **FAT32**, **NTFS**, **Linux Ext2fs** and **HPFS**. Should you have for example a Netware file system, then it cannot be adjusted by Nero to work on another harddisk or start position. This can be done only for partitions of the above mentioned file systems.

To make a long story short, we could say that burning and restoring harddisk backups can be done easily for every kind of file systems if the backup will be restored on the same harddisk and on the same start position on this harddisk. If it is restored on another harddisk or on a different start position, then this will be possible only with the filesystem supported by Nero.

Nero currently does not support data compression and exclusive burning of the used harddisk sectors. For Nero, a partition is currently a sequence of harddisk sectors. But this is actually not a bad point, as prices of CDRs are going lower and lower nowadays. Of course we will add compression and storing of only the used sectors as soon as possible.

Restoring of Nero harddisk backups

Restoring Nero harddisk backups is possible only from DOS mode. Actually, under the DOS system, all parts of the operating system are resident in the PC memory. That is why the entire harddisk can be overwritten without crashing the current operating system. It would never be possible to overwrite an active Windows system.

Of course the CD ROM drive must be accessible under DOS, so that the Nero restoration program „NRESTORE.EXE“ can read the backup CDs. So you will probably have to boot either from a bootable floppy disk or a bootable CD and make sure that you have the correct DOS drivers for your CD ROM drive in the config.sys and a MSCDEX call in your autoexec.bat file. Hint: You can use the Windows 98 boot disk on most systems, because it contains drivers for all ATAPI CD ROM drives and drivers for many SCSI CD ROM drives.

Now you can run the program „NRESTORE.EXE“ from the MS DOS prompt. At this time you should insert the first backup CD in your CD ROM drive. Please select the drive letter of your CD ROM drive by using the cursor keys and then pressing the return key. You can jump from one control element to the next by using the tab key.

You can now select the destination harddisk and partition and begin the harddisk restoration. During that time you will see the current progress in percent in the lower part of the screen. You will have to restart your PC after the restoration process is finished.

Restored and then...?

Please note that the Nero restore program is able to restore Partitions, but this does not necessarily mean, that the restored harddisk is bootable afterwards:

- If you change the sequence of the partitions on your harddisk, then you will have probably lots of problems, because the drive letters of the partitions get mixed up. Some boot selectors might be wrongly configured. Under Linux, you will probably have to boot from an emergency disk, edit the file `\etc\fstab` and reconfigure Lilo to get a bootable system again. If you restore operating systems behind one of the magical 2 or 8 GB borders, then they might no longer be bootable.

- You might also get problems if you restore partitions from several harddisk on another harddisk and forget to add a bootable partition or to mark one partition as active. In this case you should be able to set the active partition by using FDISK.
- If you restore a bootable operating system from one hardware platform (mainboard, processor, graphics card, network card, SCSI controller and so on) to another one, then you might also be unable to boot the operating system, because it probably will not have the correct drivers for your new hardware. You will have to experiment to see whether it works or not, because the results may differ from case to case.
- If you restore a harddisk backup onto a larger harddisk, then you'll get unused harddisk space. To use the entire space we would recommend to create another partition using FDISK or resize your partition with a program like PowerQuest's PartitionMagic, since Nero does not support partition resizing.

Limitations of the Nero backup feature

- Nero currently supports only the file systems FAT16, FAT32, Linux ext2fs and NTFS.
- There is not automatical conversion from FAT16 to FAT32. That means you cannot restore a 1 GB FAT16 file system onto a 10GB partition, because FAT16 supports only partitions up to 2GB.
- Defect sectors mappings are currently not supported by Nero.
- Compression and burning of used sectors only is not supported yet.
- Single files can not be restored yet. Only partitions and entire harddisks can be restored.