

19 tips for enhancing CD-ROM performance

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Finetuning CD-ROM performance can encompass a range of enhancements, delivering major to modest improvements. Performance can be enhanced for the workstation as well as the workstation manager. The following tips are offered from the author's experience with IBM-compatible CD-ROM workstations; many of the tips apply to Macintosh CD-ROM workstations.

HARD DISK

- OPTIMIZE FILES

Disk optimization software like PC Tools' Compress or Norton Utilities' Speed Disk physically rearrange files on the hard disk so that each file's data resides in contiguous data sectors on disk. Unused disk space is placed at the end of the hard disk, on the inner tracks farthest from the read-write head. CD-ROM search software will load and execute more efficiently if its component data is written contiguously on hard disk. The hard disk head will read it quickly rather than search around the disk for scattered sectors. Optimize the hard disk after installing each new version of CD-ROM software.

- PLACE CD-ROM SOFTWARE FILES AT FRONT OF DISK

The files comprising the CD-ROM search software should be placed first on the hard disk so that the CD-ROM software loads and executes more quickly. The disk's read-write head performs fastest on the outer tracks and not the inner tracks; therefore CD-ROM search software should be placed on the outer disk tracks (those first on the disk). Disk optimization software offer this as an option; use this option when optimizing after installing each new version of CD-ROM software.

- USE DISK CACHE SOFTWARE

Disk cache software like PC-Kwik Power Pak, Norton Utilities's Norton Cache, DOS 5's SMARTDRV, PC MagNet's DCACHE, Windows 3.1's SMARTDrive, PC Tools' PC-Cache improve hard disk performance tremendously. Disk caching improves reading and writing to hard disk. CD-ROM search software will load efficiently. If the CD-ROM search software builds and reads scratch files on the hard disk, then cache software will

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improve that activity. Experts recommend at least 64K disk cache, with 256K being highly desirable. Performance will continue to improve up to 1 megabyte cache size; cache sizes beyond 1 megabyte show little benefit for the memory commitment. CD-ROM workstations should be purchased with at least 2 megabytes extended memory; 4 megabytes is a better choice to afford maximum flexibility for other software using memory. Commit one megabyte of extended memory to a disk cache. Be sure to set the BUFFERS= value in CONFIG.SYS to a minimum, eg BUFFERS=2, if using cache software. BUFFERS are redundant with disk cache software, thereby wasting RAM memory.

Disk cache software will not cache device-dependent CD-ROM drives (those using MSCDEX - Microsoft CD-ROM Extensions) but will cache SCSI CD-ROM drives. Hard disk controllers with a built-in cache are available but are expensive and do not always offer a noticeable improvement over software disk caching.

#### - AUTOPARK

A hard disk is susceptible to damage when the CD-ROM workstation is jostled or bumped severely. At many sites, CD-ROM workstations are running continuously, including overnight when custodians are in the building and vacuuming around the CD-ROM workstations. Automatic parking of the hard disk read-write head to a safe position, while the workstation is on, is desirable. Public domain utility software (eg TIMEPARK) are available to automatically park hard disk heads after a specified period of inactivity; these software are RAM-resident and loaded from the AUTOEXEC.BAT file.

#### - CHECK THE INTERLEAVE

Norton Utilities' Calibrate, PC Tools' DiskFix, SpinRite, Optune, and other software will examine, advise, and reconfigure an older hard disk's interleave factor (the arrangement of data sectors on disc). Frequently hard disk interleave factor is set conservatively at 3:1 on older hard disks and can be decreased to 2:1 to yield more performance. Any read or write operation (loading CD-ROM software or creating scratch files, respectively) will improve. Newer hard disks (eg IDE-interface disks) will be set for the optimal 1:1 interleave factor.

#### - BROWSE FOR ORPHAN FILES

Users merrily download files to the hard disk; some downloaded files will be surprisingly large. These files are rarely deleted by users who may be precluded from doing so when access to the DOS prompt is restricted. These orphan files, particularly those large in size, accumulate over time and degrade hard disk performance. In addition,

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these files consume more floppy disks when the hard disk is backed up.

To identify orphan files, you need to know the files that were originally installed in each directory, including the root directory. Record each directory's (including the root directory) list of files by changing to each directory in turn and typing DIR > PRN. This command prints each directory's file contents; use these pages subsequently when browsing each directory for orphan files (using the DIR command). These orphan files will frequently be in the same directory as the CD-ROM software. Delete these orphan files before optimizing the hard disk. Optimization of CD-ROM software to the front of the hard disk will carry along these large orphan files unless they are deleted before optimizing. Having orphan files interspersed with CD-ROM software will degrade loading and execution of CD-ROM software. Browse for and delete orphan files monthly or quarterly; experience will dictate an appropriate frequency.

- USE CHKDSK/F

DOS' CHKDSK identifies misplaced data (lost chains or clusters) that have lost their pointers in the hard disk's table that locates files (file allocation table). These lost chains accumulate over time and consume disk space. This wasted space needs to be regained before running disk optimization software. Speculations vary about the genesis of lost chains; run CHKDSK/F regularly and answer "no" when prompted to convert the lost chains to files. DOS will rename the lost chains to consecutive files in the root directory, starting with FILE0000.CHK. Take a look at these files with an ASCII fileviewer to watch for a problem brewing; then delete them.

There is a slight risk in answering "no" when prompted by CHKDSK/F since stray data that is part of an existing file will be shifted to new files (FILE0000.CHK etc). This stray data could have been linked up with its partner data by using a hard disk utility software. The conservative alternative is to run CHKDSK without the /F parameter and answer "no" when prompted; then run a hard disk utility software to fix the lost chains. The less-conservative author has been using CHKDSK/F followed by "no" for many years on CD-ROM workstations and has never regretted the risk.

To keep a hard disk scrupulously clean, run CHKDSK/F automatically in the AUTOEXEC.BAT by adding the line "ECHO N|CHKDSK/F". "ECHO N" answers "no" automatically to the conversion question posed by CHKDSK/F. Automatic deletion of the FILE000s can be accomplished by putting the line DELETE C:\\*.CHK in AUTOEXEC.BAT.

- LOW-LEVEL FORMAT HARD DISK

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Over time, the hard disk's read-write head gradually creeps out of alignment with the magnetic tracks originally laid down on the hard disk. If a microcomputer is shifted from a horizontal to a vertical position, then this shift may occur suddenly. A non-destructive low-level format of the hard disk using SpinRite, Optune, Norton Utilities' Calibrate, PC Tools' DiskFix, or other software will rewrite the magnetic tracks on the hard disk, thereby realigning them with the read-write head. It is essential to do this every six months to a year. If not done regularly, then the risk is that the microcomputer will not be able to boot up on the hard disk. This problem can appear intermittently or suddenly, and, will cause considerable distress.

## MICROCOMPUTER

### - PURCHASE MICROCOMPUTERS WITH LARGE RAM CACHE

RAM caches speed up the execution of CD-ROM software and work in conjunction with the microprocessor chip; RAM caches are not the same as disk caches. RAM caches are not available in less expensive microcomputers; more expensive microcomputers have them in 64K and 256K sizes. The price differential between 40MHz 386 microcomputer motherboards with RAM caches of 64K and 256K is approximately \$40. Complete microcomputers with those motherboards should not be priced much farther apart, with other components being equal. Performance can be improved for a minor additional outlay at the time of purchase.

### - STEP UP IN MEGAHERTZ AND CPU

Purchase as fast a microcomputer as your budget allows, with speed indicated by microprocessor power and megahertz speed in addition to RAM cache. If purchase funds are limited, consider incremental gains. For example, the price differential between a 33 MHz 386 microcomputer motherboard and a 40 MHz 386 microcomputer motherboard is approximately \$30. Complete microcomputers with those motherboards should not be priced much farther apart, with other components being equal. The price differential between 386 and 486 microcomputers is much greater (at the time of writing of this article). The best value for the budget-conscious speed-seeker is the 40 MHz 386 microcomputer with 256K RAM cache. 486 microcomputers will drop in price in the months ahead, particularly after the introduction of the P5 (aka 586) microcomputers.

### - GET MORE MEMORY & USE MEMORY MANAGEMENT SOFTWARE

Purchase CD-ROM workstation microcomputers with at least 2 megabytes of extended memory; 4 megabytes of extended memory is advantageous,

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particularly if CD-ROM vendors produce Windows versions of their search software. Extended memory can be used for faster temporary scratch files used by CD-ROM software, RAM disks to run CD-ROM software faster, disk caches, print spoolers, utility software, screensavers, etc. Memory management software like QEMM-386 or 386Max are essential for optimal utilization of extended memory resources. Optimization of memory resources by these software will be an automatic process for most users. When software creates memory conflicts, memory management software are supplied with memory analysis software to assist in deducing and resolving conflicts.

- PUT FULL PATH BEFORE SOFTWARE LOADED BY AUTOEXEC.BAT & BATCH FILES

The AUTOEXEC.BAT file and other batch files execute faster if each software specified in the batch file is preceded by its path. For example, if MSCDEX.EXE resides in the C:\UT directory, the line in the AUTOEXEC.BAT file loading MSCDEX should be C:\UT\MSCDEX.EXE. If MSCDEX.EXE's path is not specified, then DOS has to search each directory in the PATH= line of the AUTOEXEC.BAT file until it finds MSCDEX.EXE in the UT directory. If C:\UT is listed several directories down in the PATH= line, then time is wasted looking for MSCDEX. Incremental time is wasted looking for each software without its path. Therefore, put the path before each software in AUTOEXEC.BAT and batch files.

- REM SOFTWARE-SPECIFIC LINES IN AUTOEXEC.BAT & CONFIG.SYS

REM and the words following it are ignored when AUTOEXEC.BAT and CONFIG.SYS execute. REM lines serve as internal notes within these files or any batch file. During installation, CD-ROM software may insert new line(s) into AUTOEXEC.BAT and CONFIG.SYS files. Use REMming to denote the CD-ROM software responsible for each line. It is important to know the owner of each line in these files, particularly for CD-ROM workstations accessing multiple CD-ROM products. If a CD-ROM software is removed, lines in AUTOEXEC.BAT or CONFIG.SYS may become extraneous and can be removed, thereby saving memory and/or reducing the size of the microcomputer's environment. However each line's owner has to be known before deleting lines. Similarly, if conflicts among CD-ROM or other software have to be resolved, each line in AUTOEXEC.BAT and CONFIG.SYS may have to be examined to determine the culprit and it is helpful to know what each line does.

Type "REM" following by a short statement identifying the owning software. For example, the following lines from an AUTOEXEC.BAT identify the SET commands necessary for Compact Cambridge's Aquatic Sciences and Fisheries Abstracts CD-ROM and Dialog's Aerospace Database CD-ROM.

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```
rem NEXT LINE FOR ASFA
set cc_dvr=cdrom
rem NEXT 3 LINES FOR AEROSPACE
set cdopt=/l:ot/n:0/w:80/x:0/m:h
set cdpathd=e
set temp=c
```

- FEED PAPER INTO THE PRINTER FROM A BOX ON THE FLOOR

Users of public-access CD-ROM workstations go through considerable paper. Save your time by using large batches of paper set in a box on the floor (or use a whole box), rather than small batches loaded under the printer stand. Feeding paper from the floor is not tidy but it is very effective.

- BOOT UP IN TURBO MODE

Running a CD-ROM workstation in turbo mode will enhance CD-ROM performance greatly. Turbo mode is usually engaged by pressing specific keys simultaneously, pressing a turbo switch, or, running a turbo switching utility software supplied with the microcomputer on purchase. It is worth the effort to track down this software if it is not at hand; turbo mode is appreciably faster. It is best to engage turbo mode automatically with software since users will not be aware to do it on their own with keystrokes or switches; additionally it becomes tedious for staff to do the switching after each bootup. The turbo switching software should be loaded from the AUTOEXEC.BAT file in the first line or two. Switching into turbo at the beginning of the AUTOEXEC.BAT file will speed execution of the rest of the AUTOEXEC.BAT file.

- NUM LOCK OFF

Many microcomputers bootup with the NUM LOCK switch on, resulting in numbers appearing when the numeric keypad is used. Since cursor keying is an essential feature of CD-ROM software and numeric keying is rarely used, CD-ROM workstation performance is enhanced by converting the numeric keyboard to cursor keys. Many users find the cursor keys easier to use on the numeric keypad than on the enhanced keyboard's separate cursor keys. Public domain utility software are available (eg OFFNUM, TOGGLE) as well as commercial utility software to switch NUM LOCK off automatically from the AUTOEXEC.BAT file.

- SPEED UP CURSOR KEYS

Many CD-ROM software rely on cursor keys to scroll up and down through text onscreen. To increase this scrolling speed, the speed of

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keystroke repetition when cursor keys are pressed and held down (the RATE) has to be increased. Use DOS' MODE command or other commercial and public domain software. To AUTOEXEC.BAT, add the line MODE CON: RATE=X DELAY=Y, wherein X=1-32 and Y=1-4. The minimum RATE=1 is approximately 2 characters per second; the maximum RATE=32 is approximately 30 characters per second (default RATE= value is 20). If the RATE is set with MODE, then the DELAY must be specified. DELAY is the time interval after a key is pressed before it is repeated. DELAY ranges from 0.25 second (DELAY=1) to 1 second (DELAY=4). Experiment with various settings. Be sure to put MODE's path in front eg C:\DOS\MODE....

#### - PROTECT YOUR ENHANCEMENTS

Most CD-ROM software automatically modifies your AUTOEXEC.BAT and CONFIG.SYS files upon installation; you need none, some, or all of these modifications. Not every installation routine saves the old versions of your AUTOEXEC.BAT and CONFIG.SYS files. Your healthy and compatible AUTOEXEC.BAT and CONFIG.SYS files may be destroyed and the installation process may give you conflict-ridden files in their place. Keep copies of AUTOEXEC.BAT and CONFIG.SYS files in a hidden directory where they will be safe from automatic modification by installation routines. After installing a new CD-ROM software, compare the post-installation (modified) files in the root directory to the pre-installation files (unmodified) in a hidden directory and decide if the modifications are necessary and in the correct sequence within AUTOEXEC.BAT and CONFIG.SYS.

A simple technique to protect your AUTOEXEC.BAT file from automatic modification by installations is to rename it and have a one-line AUTOEXEC.BAT file run a renamed AUTOEXEC.BAT file. For example, the actual AUTOEXEC.BAT can be renamed START.BAT and the AUTOEXEC.BAT file can consist of one line: START.BAT.

#### CD-ROM PLAYER

#### - PURCHASE A FAST CD-ROM PLAYER

Not all CD-ROM players are alike. CD-ROM Professional, PC Magazine, and other microcomputing magazines publish reviews quantifying performance of CD-ROM players. CD-ROM players vary in the size of their RAM cache. Sizes vary from 2K to 64K; the larger RAM cache will offer quicker access to CD-ROM data. Other factors influence CD-ROM player speed. The speed of CD-ROM players in accessing data is measured in milliseconds, with lower times being better. CD-ROM players vary in their throughput of data (random and sequential),

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measured in kilobytes per second; higher throughput rates are better. SCSI interfaces are faster than serial interfaces. It can get complicated reading these review articles, and, those making the purchase decision do not have the study time to become experts. A review article by Bruce Connolly, entitled "Review Roundup: CD-ROM Drives" [ONLINE 16(2):36-39, March 1992] provides considerable assistance in sifting through the CD-ROM players available (at the time of Connolly's review). Connolly distills several articles reviewing IBM and Macintosh CD-ROM players into a highly readable review. Though review articles become outdated, the specifications and features of the best performing players at the time of review can be used as a baseline to judge future CD-ROM player models.