SPEEDING UP WORDPERFECT

PC Development

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SPEEDING UP WORDPERFECT

As the demand for new functionality in WordPerfect rages on, PC Development continues to fashion a word processor that is "nearly everything" to "nearly everyone." But because our DOS heritage includes the "640K barrier," new functionality often comes at the expense of program speed. How to "speed up" DOS applications, including WordPerfect 5.0 and 5.1 is a simple question with a complex solution that involves the resources available to you (your time and money), those available to your system (compatible with your hardware), and most often a trade-off between speed and functionality in the application itself. The optimum allocation of each resource can be found only through experimentation. The purpose of this document is to introduce the factors involved in program speed, and to present the issues you should consider in determining how to best "beef up" your system.

Speeding up nearly any DOS application can be done by acquiring any or all of the following:
• 	Faster Hardware
• 	More Memory
• 	Faster File I/O
While the most significant increases in speed will come from investing in these three resources, there are additional measures you can take to speed 5.1 specifically. See *Fine Tuning WordPerfect 5.1*.

Faster Hardware
The overall speed of your machine consists of processing speed and the speed at which the data is transferred to or from the system's devices (i.e., screen, disk, printer.) Components that affect machine speed the most are the CPU, the data bus width, and disk system speed.

Processing Speed/Bit Class
That little silicon chip inside your PC known as the microprocessor or CPU (central processing unit) is the "brain" of your machine. It processes data in chunks of 8, 16, or 32 bits at a time. Adjacent to the CPU lies the data bus, a flat strip of wires that carry data, controlling signals, and electrical power to all the major parts of your computer. The wider the bus, the greater the amount of data it can move in a single operation (8, 16, or 32 bits). The rate at which the CPU processes and the bus transfers data indicate the machine's "bit class."

Megahertz
Megahertz (MHz) is a speed rating applicable to machines of the same bit class.[1] For example, a 10 MHz XT (8088) runs at twice the speed of a 4.77 MHz XT. However, a 10 MHz XT runs only half as fast as a 10 MHz AT. Although both machines transfers chunks of data at the same rate, the chunks handled by the AT are twice as big (16 bits) as those handled by the XT (8 bits).

Original PC/XT (8088)
Although the original PC or XT[2] is classified as a 16-bit machine, it has to break the data into 8-bit chunks to feed it through its narrow 8-bit bus since the 8086/88 chip does manipulate information in 16-bit chunks,. So, processing speed for this machine is essentially "8-bit." PC/XT's (8088's) process at a rate of 4.77 MHz while Turbo XT's get up to 10 MHz.

PC/XT (8086)
The higher grade PC/XT (8086) includes a 16 bit bus that makes it a true 16-bit machine.

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[1]Due to the vast number of variables involved in overall machine speed, a standard "machine speed index" has not yet been established.
[2]The difference between a PC and an XT is not the CPU itself. Rather, when hard drives became a standard component of the PC it was given the name XT.

Therefore, data can be processes and transferred more quickly on a PC (8086) than on a PC (8088). 8086 machines process at rates of 4.77 and 10 MHz.

AT (80286)
AT class machines also process 16 bits per operation, but because of optimized machine code in the computer's ROM, the AT can complete machine operations in a shorter period of time. AT's process at speeds of 6, 8, 10, 12, 16, and 20 MHz.

386/486 (80386/486)
Although both 386 and 486 machines process and transfer data 32 bits at a time, the majority of computer devices are still only geared for 16 bit transfer, which causes a slowdown in general machine speed. Therefore, a 386 (20MHz) runs only about 50% faster than a 286 (20 MHz). Two factors that make a 486 machine faster than a 386 are its optimized machine code and a 4K "instruction cache" built into the CPU itself. The cover story of the Sept PC Magazine indicates that the slowest 486 (25 MHz) runs 10% faster than the fastest 386 (33 MHz). 33 MHz is currently the maximum speed available for both 386 and 486 machines, however, the 486 (50 MHz) is anticipated for release to the public before 1991.

Disk Drives
Handling data on disks is slow compared to the transferring of data to most other devices because so many moving parts are involved. Whether your machine is high or low speed, there is a disk drive to match its performance. You don't want a low-speed disk in a high-speed system as it greatly reduces the efficiency of the machine, neither do you want to waste money on a high performance drive if you're running an original PC.

The speed of your disk system is a result of the drives *average access time* and the rate at which data is transferred to or from the disk. *Average access (or seek) time* is the average time it takes for the disk head to move to the right track and for the disk to rotate the correct sector under the disk head. The lower the number, the faster the drive. Transfer time is a result of how fast the drive spins, how dense the stored data is and how quickly the data is transferred to or from disk to or from the CPU.

All disk systems can be categorized in one of the following groups:

Low Performance Disk Systems
MFM - 8086/88 and up - 80 to 115 ms.
RLL - 8086/88 and up - 50% faster than MFM, "data compression" allows greater storage capacity.

High Performance Disk Systems
ESDI - 80286 and up - 28 to under 10 ms.
SCSI - 80286 and up - 15 to 5 ms. (require device driver).

Some drives can be made faster by purchasing a drive controller with caching capabilities. A dealer can recommend the best disk system for your machine.

Hard Drive vs. Floppy Disk Drives
In addition to alleviating the "floppy disk shuffle," hard drives simply outperform floppy drives. *Average access time* is lower on hard drive because the drive is constantly spinning. To read or write to the disk, the drive head must wait an average of only 1/2 rotation to begin reading. To read from or write to a floppy disk however, the drive must first begin spinning, reach a given rate, align the drive head and then begin seeking for the file or free disk space. Transfer time on hard drives is also faster because the disk spins at a much higher rate and data is stored at a much higher density than on floppy diskettes.

See *Faster File I/O: Physical Disks* for information on optimizing performance of disk drives.

More Memory

Generally, the more memory you offer to large DOS applications, the faster they'll run. If the application uses Expanded Memory (as do WordPerfect 5.0 and 5.1), making more available will cut down on disk access and increase program speed. Following are some ways to increase available memory.

Increasing Available Conventional Memory

First, if you do not have a full 640K of memory, get it. The price of additional memory chips is now a good third lower than in the recent past and until you have 640K, your machine is not giving the performance that DOS alone allows it. Once that is done, the least expensive means of speeding up your system is to be selective about the use of conventional memory by any program that stays resident while other applications are run.

Move TSR'S out of Conventional Memory

TSR is short for "Terminate and Stay Resident" and means any program or device driver that occupies or stays resident in conventional memory while you execute other applications. Common TSR's are network attach utilities (IPX.COM, NET.COM), screen or keyboard enhancing programs (Screen Saver, Repeat Performance), and device drivers (memory managers, disk cache and RAM disk drivers).

Eliminate Unnecessary TSR's

Be selective about the programs and drivers you leave resident. If you have a disk cache, be sure your BUFFERS are set to number recommended by the disk cache manufacturer. Each buffer occupies 512 bytes plus a 16 byte header of conventional memory to run. Repeat Performance requires 3.5K plus 1 byte for each character in the expanded type-ahead buffer (500 chars = 500 bytes). If you use Repeat Performance primarily for the repeat speed and can perform as well without its other features, remove it and use WordPerfect's Cursor Speed feature instead.

Load Programs High

A good memory management program can load TSR's and DOS programs (e.g., files and buffers) into High Memory[3] freeing conventional memory for application software. Some Memory managers with Load High utilities are QEMM and 386^Max (for 386 machines only) and QRAM (for 8088/86 and 286 machines).

Leaner Operating System

As DOS has been enhanced over the years, it too has increased in size and required conventional memory. Version 2.0 for example requires about 40K for system files, while version 3.3 uses 79K for system files. If you don't require the added functionality of a more recent version, it may not be worth the cost in additional conventional memory to upgrade.

Using Expanded Memory

Expanded memory can be added to 8086/88 and 286 machines in the form of cards containing memory chips earmarked for expanded memory. 386 and 486 machines however, come standard with a minimum of 1-2M of extended memory and additional registers that allow it to map expanded memory in extended memory.
Because extended memory is not only less expensive but also faster than EM boards on a 386/486, you would not want to add expanded memory to a 386 or 486 machine.

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[3]High Memory refers to the remaining 384K of 1 Meg. addressable memory above conventional memory.

See *Using Extended Memory* below for more on making expanded memory available to 386 and 486 machines.

Making Expanded memory available to your machine will benefit program speed in the following ways:

High Memory
If you have a machine with only 640K of RAM, adding expanded memory (or extended memory on 386/486's) and purchasing a memory manager with the "Load High" capability will allow you to purge conventional memory of some necessary programs/TSR's. See *Increasing Available Conventional Memory: Load Programs High* for more.

RAM I/O
With a memory management program like QEMM, a portion of expanded memory can be dedicated to a disk cache which will speed disk reads dramatically. A portion of expanded memory can also be dedicated to a RAM drive which is excellent for speeding disk reads and writes. See *Faster File I/O: RAM I/O* for more on these two resources.

Application Software
Expanded memory will speed up application software that knows how to use it by holding program data in Expanded memory before going to disk. WordPerfect 5.1, for example, uses Expanded memory to: 1) cache document virtual files (.TV#, .BV#), 2) cache program files including individual code overlays or the entire WP.FIL if /r is used, and 3) extend conventional memory workspace for various functions within WP.   Although expanded memory will greatly improve the speed of 5.1, it does use up a 64K chunk of either conventional or high memory[4] for management which may be more valuable to a user than expanded memory.

Extended Memory
Memory management programs like QRAM (for 286 and down), or QEMM (386 and up) or 386^Max (386 and up)[5] can load programs (i.e. TSR's, files, buffers, etc.) that occupy conventional memory into "high memory."[6] Memory managers for the 386 and 486 can use the rest of the available extended memory to emulate expanded memory. See *Using Expanded Memory* for more. If a memory manager is not a part of your software library, the memory can be also be useful to DOS applications as a RAM drive. See *RAM I/O* for more on RAM drives.

Faster file I/O:
Increasing the amount of available memory, both conventional and expanded, will decrease the amount of necessary file I/O, which is usually the slowest step in program execution. However, when file I/O is necessary, it's to your advantage to make that transfer/process as fast as possible. Doing so speeds access to program/virtual files, starting application programs and retrieving and saving files.

Physical Disks
In order to read or write data to or from disk, the system has to make sure the disks are spinning at the proper rate, move a magnetic head to a directory table to figure out where

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[4]64K of high memory is dedicated to the expanded memory page frame used for swapping data from conventional memory to expanded memory and back.
[5]TSR's can also be run from above conventional memory on a 286 using a LIM 4.0 EM board and QRAM for 286 machines. In this case, the programs are loaded "high" into expanded, not extended, memory.
[6]See Footnote .

the requested data is, wait for that area of the disk to come spinning around, move the heads to read it, and repeat the process if the data is scattered over several locations (as it often is).

Optimizing Disk Speed
When fixed disk I/O is necessary, get the optimum speed by seeing that your drive is interleaved and optimized to its best.

Interleaving
Hard drives come from the dealer set at a standard interleave like 3:1, which means that in order to read one track, the disk must rotate three times. This may not be the optimum interleave for your system.[7] Programs that test and adjust your interleave include OPTune and SpinRite. Setting the optimum interleave will speed disk I/O.

Defragmenting
When a file is stored on disk, DOS splits it into cluster-sized pieces and starts looking for vacant parts of your disk to hold these chunks. On a newly formatted or defragmented disk, all these chunks can be continuous and uninterrupted. But on a disk that's seen heavy use, especially one that is nearly filled, DOS has to look long and hard to find empty spaces to store the file. Later when the file is read from disk, DOS must follow the same path to find all the file pieces. "Defragmenting" the drive moves all contiguous clusters of the file into contiguous sectors on the drive, leaving free space together in a big chunk as well. OPTune, PC Tools, and Norton Utilities all have a "Defragment" feature.

Partitioning
Partitioning a large hard drive in half will decrease the size of the FAT and the average distance the drive head must move, cutting the average access time (ms.) by 8-10%. See your *DOS Reference* guide for instructions on partitioning drives.

Stand Alone vs. Network
When data is read from or written to a network drive, several additional factors affect I/O speedup: the network topology, whether Star, Ring, Bus or Tree; the physical distance and number of connections, hubs, bridges; and network connection rate, determined by your local network card. The speed of the network software and network traffic also affect program speed. Additional factors are the speed of the file server, whether or not it's dedicated, how much memory is available to it, and whether or not it has a disk cache. If your network station is a PC, you can cut out the network slowdown by copying and running DOS applications from a local drive. See *Fine Tuning WordPerfect 5.1: Networks* for more about speeding WordPerfect on networks.

RAM I/O
Handling data on disks is terribly slow because of all the moving parts involved. However, shuffling data around in memory is fast because it operates at the speed of your computer. A RAM drive or Disk Cache can use the computer's memory (conventional, expanded or extended memory) to replace or minimize access to a mechanical disk drive.

RAM Drives
RAM drives can be useful in speeding up DOS applications (including WP) that use temporary program files. WordPerfect's temporary program files can be directed to a RAM drive using the /d= startup option which will significantly speed disk reads and writes. Also temporary blocks and macros can be saved to the RAM drive for quick access during the edit session

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[7]Usually XT disk systems run best at 5:1, Turbo XT's at 4:1, AT's at 2:1, and 386/486's at 1:1. However, there are factors which an interleave utility takes into account that can affect the "usual" interleave.

and quick cleanup when the session's over.

640K, Expanded Memory Only
If your system has expanded memory and you are primarily a WordPerfect user, it may be best to reserve all available expanded memory for program use.   Creating a RAM drive from expanded memory is wise only if you often create and store your own temporary block files or macros to disk for use during a single session.

640K and Extended Memory Only
If you have only extended memory available and do not have the software to load resident programs "high," or to create a disk cache in extended memory, or to emulate expanded memory in extended memory, you can use DOS's VDISK program (shipped with DOS version 3.0 and higher) to create a RAM drive in extended memory.   Virtual files can be directed to the RAM drive instead of your physical disk using the /d= startup option. (For more on creating a RAM drive using VDISK, consult your *DOS Reference Guide*.)

640K Only
If you are primarily a WordPerfect user and have only 640K of RAM and neither expanded nor extended memory available, using conventional memory for a RAM drive is probably not wise as the drive would be so small as to render "Disk Full" frequently. A small disk cache (64K) would be a better use of the same conventional memory.

Disk Cache
A disk cache retains in memory or "caches" chunks of data most recently read from or written to disk. Built on the premise that programs frequently request the same information from disk repeatedly, a disk cache decreases the frequency of reading from the mechanical disk by caching the latest reads/writes in RAM. Writing to disk through a disk cache takes as much time as writing to the mechanical drive by itself. A Typical disk caching algorithm will flush the *least recently or frequently used* piece of data from the cache as the *most recently or frequently used* piece is stored there.

WordPerfect users from the WP Support Group and CompuServe have reported a significant increase in program speed when using a disk cache of 64k to 1M. This is due to the frequent re-reading of code from the WP.FIL file and document virtuals by the program. The disk cache should be set up on the drive containing program files (WP.FIL and temporary files). One excellent disk caching program is PCKWIK (for all machines). Consult a dealer for others.

640K, Expanded Memory Only
Expanded memory can be used to create a RAM drive, to create a disk cache, to load WP /r, or to increase program cache. The advantages a disk cache has over a RAM drive are that it overflows to disk while a RAM drive fills up like any mechanical drive and renders "Disk Full" errors. Also, a disk cache speeds the frequent reading of both temporary files and overlays from the WP.FIL, while RAM drives hold only program temporary files. A disk cache is more useful to program speed than loading the WP.FIL with /r (unless running from a network) because it caches both temporary files and pieces of WP.FIL.

640K and Extended Memory Only
If you have only extended memory available, it can be converted to a disk cache by programs like PCKWIK (for all machines). If a disk caching program is not available to you, this memory can be used by DOS applications as a RAM drive.

640K Only
If you are primarily a WordPerfect user and have only 640K of RAM and neither expanded nor extended memory available, even a small disk cache of 20-64K will increase the program's performance.

Both disk caches and RAM drives offer unique advantages and an ideal configuration may

include both, especially if both can share the same memory. PCKWIK sets up a disk cache and RAM drive that dynamically share the same memory.

BUFFERS
DOS's BUFFERS command, or the "poor man's cache," acts as a small disk cache. Each buffer reserves 512 bytes for caching. Advantages of using buffers are that it is included with DOS which costs you nothing and it doesn't require additional memory to drive as do disk caching programs--DOS takes care of it. On the other hand, the buffers command is not a well managed disk cache, the result being that what you request from it is frequently not there, forcing you to go to disk for it.

The BUFFERS command should be used as a disk cache if neither expanded or extended memory nor a disk caching program is available, but it is better than no disk cache at all. The "optimum" setting for BUFFERS is dependent on how you use your system (i.e., how often you cause repeated reads from disk combined with how large your average WordPerfect documents are and how much conventional memory you must have to use features.) An optimum setting will usually be somewhere between 25 and 35. To find your system's optimum setting, time a few common operations while altering the BUFFERS setting. If a disk cache is available, the BUFFERS command should be set at the number recommended by the disk cache manufacturer.

RAM I/O and WordPerfect
While running WordPerfect, the most common reasons for going to disk are to read pieces (overlays) of the WP.FIL into memory and to read or write document virtual files (.TV#, .BV#) to and from disk. The following startup options let you access that information from RAM instead of mechanical disk.

/r
If Expanded memory is available, using the /r startup option will load the entire WP.FIL file, which contains pieces of program code, into expanded memory. Using this option is by far the best use of available expanded memory if you are running a network copy of WP from a network drive. On stand-alone systems, however, the decision is a little harder to make. If using the /r switch leaves very little expanded memory for caching document virtual files, the speed of editing documents will be greatly decreased. However, if using /r leaves as much expanded memory as your average document size, you'll notice an increase in program speed.

/d=(ram drive letter)
The /d=(path) switch directs the writing and reading of temporary program files (including virtuals) to a drive other than the "Shared" drive where WP.EXE is located. Directing temporary files to a RAM drive will eliminate any mechanical disk access for virtuals. The RAM drive size necessary for this to be useful depends on available conventional memory, Expanded memory and average document size.

/pf=(ram drive letter)
The only temporary program files that WP does not redirect with /d are the print files (WP}WP{PJ.# and WP}WP{.Q?). Directing these program files to a RAM drive will increase the speed of printing, especially if conventional memory and expanded memory are limited.

Fine Tuning WordPerfect 5.1
After determining the best use of your system's resources, you can further improve the performance of WordPerfect 5.1 by optimizing the use of workspace and incorporating some tips to speed individual features.

Network WordPerfect
If you are running network WordPerfect on a PC workstation, copying the WP.EXE and WP.FIL

files to a local drive will cut out network slowdowns. If local disk space is not available and expanded memory is, starting WP /r will speed the program when run from a network drive. See *Physical Disks: Stand alone vs. Network* for factors that affect network applications.

Background Printing
Although background printing allows you to continue working on your document as a job prints, it slows program speed in general. In addition to the time required to relinquish control to other program features you request, printing ties up memory that is not relinquished until the print job is complete.

Increasing Available Workspace
Workspace is the amount of conventional memory and expanded memory available to WordPerfect for holding and editing documents and executing program functions. The more workspace available to WordPerfect, the less it will go to disk for data which simply means "speed." Once WordPerfect is loaded, available workspace can be increased by eliminating unused features or modifying necessary features to occupy a minimum amount of memory. You may struggle with a decision to give up some functionality for general program speed. If so, favor the resource that is most important to you in each case. (This information may also be helpful in remedying a "Not Enough Memory" error when a feature is invoked.)

Keep Doc 2 Screen Clear
When documents are displayed in both editing screens, memory is used to hold as much of both files as possible. Clearing the document editing screen frees up the memory holding the virtual files for that document. If only one document is needed in memory, leaving the other screen empty will increase the program's speed.

Also, if any of the following features are invoked with both document screens occupied, a third editing screen must be opened to accommodate the feature requiring an additional 8-14K of conventional memory.

•Sorting
•Generating
•Printing a Document Summary
•Printing Document on Disk or from List Files that is not formatted for the current printer or that is fast saved for the current printer.

Size of .PRS
Decreasing the number of fonts selected in your .PRS file (especially page printers with several fonts available) decreases the amount of memory needed (73 bytes per font you remove) to display the base font list and to print documents formatted for that printer.

If your current .PRS file has 200 fonts selected, first unmark the fonts you have never used or rarely use, then divide those fonts you do use into smaller related groups. For example, one .PRS file may contain serif fonts used for building basic documents, (i.e., a variety of sizes of normal, bold, and italic in one typeface) while another .PRS file contains the same variety for a san serif font, and a third .PRS file has the large or unusual typefaces, dingbats, etc.

Text Driver
5.1's text drivers offer new editing screen functionality, however, a selected text driver monopolizes an average 4K of workspace.

Expanded Memory Buffer
WordPerfect's use of expanded memory has greatly improved program speed by caching virtuals and the WP.FIL file and lending working memory to a few features. However, in

order to use this expanded memory, WP reserves 4K of conventional memory for buffering data to and from expanded memory. Until all WordPerfect features are made to use expanded memory for working memory, this 4K buffer may be a liability in some cases. If a function like spell checking or viewing a large document continually renders "Not Enough Memory," re-starting WP with /ne (for "No Expanded" memory), will free up 4k more of program workspace.

/nh
If you are unable to make use of the Printing to Hardware Port feature (i.e., you do not have a local printer, your port or printer do not support it, or your printer requires a special driver), using the /nh switch (for "No Hardware" port printing) will free up 512 bytes of program workspace.

/w-*,*
If running under Library or Office Shell, WordPerfect uses all available conventional memory and only half of the available expanded memory. Without Shell, WordPerfect uses all available conventional memory and 87% of available expanded memory. Using the /w-*,* switch will make all expanded memory available to WordPerfect which will increase workspace for those features that use expanded memory for working memory. (Note that running Shell at all takes up 47-50K of Conventional memory. You may consider running without Shell resident when program speed is a higher priority than Shell functionality.)

Keyboards Resident
Selected keyboards occupy workspace to match their size on disk. Available workspace can be increased by deleting any unused macros from your selected keyboard. If workspace is very small, you may choose to save your useful macros to disk so they will only occupy memory while they are being used individually. The functionality you lose by doing so is: descriptions for all macros cannot be seen on a single screen, all macros must become Alt or named macros, and the macros themselves must be read initially from disk instead of RAM.

Speeding WordPerfect Features
Some measures you can take to enhance the speed of individual WordPerfect features are described below.

Printing
•The Print to Hardware Port feature (6-29-90 or later) will speed printing to local serial and parallel printers. The /bp=(kilobytes) switch sets the buffer size for printing to hardware port (default is 512 bytes). If your printer is relatively slow, increasing the size of this buffer will allow WP to continue working without waiting for the printer. Although the maximum setting is 63K, a setting greater than 20K taxes available workspace so much as to cause a decrease in printing speed.

•The /pf switch can be used to direct temporary print files to a RAM drive. Temporary print files are the only program files not redirected with the /d switch.

•Decreasing size of .PRS. Decreasing the number of fonts selected in your .PRS file (especially page printers with several fonts available) decreases the amount of memory needed (73 bytes per font you remove) to display the base font list and to print documents formatted for that printer. See *Increasing Available Workspace: Size of .PRS* above for more details.

•Staying at the Edit or Print Control Screen without using the keyboard will increase the speed of printing by up to 10%. Staying in Print Control is one tenth of 1% slower than staying on the Edit screen.

•Graphics printing is one of the few 5.1 features that use expanded memory workspace before going to disk. Installing expanded memory will speed graphics printing.

•Generating Number of Copies at the printer is faster than instructing WordPerfect to generate the copies.

•If you're working with downloadable softfonts, marking the frequently used fonts with "*" and initializing the printer once a day will save the time required to download fonts with each print job.

•Printing to network printers on Novell Netware from Network WordPerfect is faster when jobs are sent to a server/queue name than when jobs are sent to a "captured" port. Earlier Netware like version 2.01 prints faster when jobs are sent to a server/spooler# than to a "spooled" port.

If more than one printer of the same kind is available, and your network software is capable, servicing the multiple printers through a single queue will ensure a more "equal wait" among users than addressing the individual printers through separate queues.

Macros
Macros will execute more quickly if the display is turned off. Place {Display Off} at the top of the macro.

Editing/Scrolling
•Editing and scrolling through a document with Reveal Codes on is slower than with Reveal Codes off because WP must display much more with every cursor movement. The upper half of the display must also be re-centered much more frequently. An additional factor, though minor, is that the pieces of code that display the Reveal Codes screen and move the cursor share the same spot in memory and must shuffle in and out of memory with each cursor movement. Turning off Reveal Codes will speed scrolling and editing significantly.

•Scrolling through Columns is faster when columns are not displayed side by side. Change the setting in *Setup (Display): Edit Screen Options*.

•The Automatically Format and Rewrite feature causes WP to frequently re-fresh the full editing screen. Setting this option to "No" will also speed editing and scrolling. See *Setup (Display): Edit Screen Options*.

Saving
Normally documents are fast saved which means that WordPerfect does not format the document for printing before saving it. If you edit and save documents more frequently than you print them, you will speed the saving process by leaving or setting Fast Save to "Yes."