



Guide to Mastering New Media

Computing Systems & Multimedia

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The Computer Life Guide to Mastering New Media

The Computer Life Guide to Mastering New Media was compiled and edited by Rich Santalesa and David Harvey of R&D Technologies. The information in this collection first appeared in a variety of sources, including Ziff-Davis Press books, Ziff-Davis publications, and the Ziff-Davis online service, ZiffNet. This collection also includes original material from R & D.

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Why Mass Storage?

Why include a whole section on a topic as mundane as mass storage? After all, storage technologies aren't really as exciting as digital audio or video recording systems. Besides, the only kind of storage device that most users come into contact with is a CD-ROM or a video game cartridge.

Here's the reason: By using improved storage technology, producers can enhance the quality of digital video and audio media files and, ultimately, the complexity of the titles that you see. The digital audio and full-motion video files added to multimedia titles require huge amounts of storage and put a tremendous strain on mass-storage technology. The digital movie that you see in your favorite game title might look small to you, but it was a much larger digital video file before it was compressed and optimized for playback on a CD-ROM or a video game cartridge.

Storage is a major concern during production, because two of the best features of multimedia—digital audio and video—are also the biggest storage hogs. A single minute of CD-quality stereo sound will fill up just over seven high-density floppy disks or 10 megabytes (MB) on a hard disk drive. Digital video is even more demanding; a single second of full-screen digital video with good quality audio can eat up over 80MB of hard disk space, enough to fill 60 high-density floppy drives.

Storage space isn't the only problem; to work properly, digital video and audio digitizer cards must quickly send tremendous amounts of data to and receive it from a hard disk when you record or play back audio or video. This also puts some severe limits on the type of drive that you can use for digital media production, because most drives send and receive data at less than half the volume required by some digital video editing systems.

From "How Multimedia Works," by Erik Holsinger, © ZD Press 1994

How Big Hard Disks and Drive Arrays Work

Not only do digital video and audio take up tremendous amounts of hard disk space, but they also need drives that can send large amounts of data back and forth quickly to keep the audio and video playing and recording smoothly. Currently, magnetic disk drives are the only technology that can handle the demands of sophisticated digital audio and video production.

Related Topics:

[Hard disks required for multimedia production](#)

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Hard disks required for multimedia production

Because of the high amounts of storage required for digital audio and video, as well as graphics, most multimedia producers invest in at least a single external hard disk drive. Hard disk drives offer speed (they can get to or access data very quickly), high data throughput (they can send large amounts of data to and from the computer), and plenty of storage space (most producers use drives that are 1GB or larger).

Using drive arrays in production

Drive arrays are two or more hard disks that are grouped together so that they act like a single hard drive. This arrangement can drastically increase the quality of digital video by increasing the amount of data that you can record at one time.

Digital Video

When you record digital video, using higher-quality settings causes the amount of compression to decrease. This also increases the amount of data that the digital video system needs to send and receive from the hard drive. This problem is compounded when you record full-screen video images with some digital video systems, which can swamp even the fastest single hard drives with the amount of data that they send at one time.

However, by using two or more disk drives simultaneously, a drive array can boost the data throughput by as much as five times the rate of a single hard disk drive.

How Fast Magneto-Optical Drives Work

Magneto-optical (MO) technology is the most exciting development in multimedia mass storage, because magneto-optical disk media offers large amounts of storage in a durable package. As optical drive and optical media technology continues to develop, magneto-optical technology has expanded into archiving, transporting and recording video, audio, graphics, and animation files.

Related Topics:

[Archiving/secondary backup:](#)

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[Digital video/audio recording:](#)

[Writing Data to a Magneto-Optical Disk](#)

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Archiving/secondary backup:

While the cost per megabyte is higher than with DAT or 8mm tape, MO disks are also used to back up media files during and after a production. Unlike with most DAT or 8mm tape systems, you can read and access files on an MO disk in real time as though they were on a different hard disk.

Transporting files:

MO disks are great for transporting files from one office to another, even if the offices are across the country. MO disks aren't affected by shock or stray magnetic fields the way that hard drives, floppy disks, and tape backups are, so you can feel secure sending your precious production files via air or local courier.

Digital video/audio recording:

Magneto-optical disks have historically been three to four times slower than even average magnetic hard disk drives. However, several new drive technologies have increased MO drives to nearly equal hard drives in speed and data throughput. This allows you to use them for recording CD-quality audio, or small, quarter-screen digital video onto MO disks. However, the speed of MO drives has to increase drastically before you can use them to record high-quality full-screen video.

Writing Data to a Magneto-Optical Disk

- 1.** An intense laser beam is focused on the surface of the disk, which is composed of a crystalline metal alloy only a few atoms thick. The alloy, which can polarize light, rides on an aluminum substrate. Both the alloy and the substrate are sandwiched between two sheets of plastic.
- 2.** The laser beam heats a tiny spot in the alloy past a critical temperature known as its Curie point. At the Curie point -- which varies for different materials -- the alloy's crystals are loose enough so that they can be moved by a magnetic field.
- 3.** A write head, similar to that in conventional drives, creates a magnetic field that realigns the alloy's crystals in one direction to represent a 1 bit, and in another direction to represent a 0 bit. The area affected by the laser beam is so small that 256MB of data can be stored on a single side of a disk.

Reading Data from a Magneto-Optical Disk

- 1.** A weaker laser beam is focused along the tracks that contain data written earlier by the more intense laser beam.
- 2.** The laser beam is reflected by the aluminum surface beneath the alloy layer. As the beam passes through the alloy, the aligned crystals polarize it, allowing only rays of light vibrating in a certain direction to get through.
- 3.** A sensor reads the reflected light and determines the direction of its polarization. The alignment of crystals in 1 bits polarizes the light in one direction, and that of crystals in 0 bits polarizes it in another direction.

How DAT and 8mm Tape Backup Systems Work

DAT and 8mm tape backup systems are for keeping a safe copy of all your materials during production, and then archiving the numerous media files after you've completed your project. DAT and 8mm tape are currently the most economical media for backing up the many large files that quickly fill up hard drives during multimedia production.

Just the media elements from one project can completely fill up even a large hard disk. Using a tape backup system is an inexpensive way to archive large amounts of data without using another disk drive.

Most DAT systems can hold up to 1.3GB of uncompressed data, while 8mm tape systems can hold from 2.5GB to 5GB of uncompressed data.

A Disc Is A Disc...

Question: How can you take four cubic feet of floppy disks and hide them inside a paperback novel?

Answer: CDROM.

Even if you know nothing about computers, the idea of a CDROM should seem natural and logical. CDROM are based on standard audio compact discs (CDs), which hold more than 60 minutes of very highfidelity music on one side. The music is recorded digitally, as a series of 1's and 0's, instead of in the analog formats of records and tapes. The 1's and 0's are represented by very small hole cut into the surface of the CD itself.

Inside the CD player, a small laser reads these holes, and electronic circuits translate the patterns of dots into music. Add an amplifier, and some speakers or headphones, and you have music. One of the delights of CDs is that they are practically indestructible. You can touch them, spill coffee on them, or leave them around for the cats, dogs, or children to walk over, and they will still play with only minor degradation of sound.

From: PC Sources, Jan 1992 v3 n1 p553(4)

Author: Hardin Brothers

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Inner Workings

A CDROM for a computer is much the same as an audio CD. The 1's and 0's used on a CD are also the building blocks of all computer data, so a CDROM disc is recorded in much the same way as an audio disk. It is also the same size, which means the same factories can produce both audio disks and computer disks. The computer version of a compact disk is called a CDROM because the computer can read from it, but not change any of the data; the CDROM is a readonly device just like the readonly memory (ROM) chips that contain your computer's BIOS.

A CDROM player attached to your computer appears to DOS as just another disk drive. However, instead of being limited to the puny 360K of a standard floppy, the 1.44MB of a highdensity microfloppy, or even the 150MB of a fairly large hard drive, a CDROM can have up to 660MB of data.

From: PC Sources, Jan 1992 v3 n1 p553(4)

Author: Hardin Brothers

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Information on a Platter

At first, it is difficult to grasp just how much can be stored in the 660MB of a typical CDROM. A fullsize encyclopedia fits easily, along with pictures, a hypertext crossreference, and the software for accessing all the information. So does a museumfull of art works, complete with discussions of each work and each artist. One CDROM can hold an entire shelf of reference manuals, a shelf of programming manuals, or the 13volume Oxford English Dictionary. Four CDROMs, which take up only an inch on your desk, can hold about 1,000,000 pages of text.

But CDROMs are not confined to text. Since they look just like a new disk drive to the computer, they can hold files of any type: text or database files, executable programs, still images or animation, computer audio data, and even standard audio data. This flexibility makes CDROMs ideal for applications like huge parts catalogs, along with the software to use the catalog; hypertext reference works with images and photos; sets of manuals; and educational material. The huge capacity and low manufacturing cost (after the data has been prepared) of a CDROM has led to the development of computerbased multimedia. A CDROM player is part of the definition of a level 1 multimedia personal computer (MPC), which must contain the following: a player, an 80286 or higher CPU, a sound board, a mouse, Windows, and the multimedia extensions to Windows.

From: PC Sources, Jan 1992 v3 n1 p553(4)

Author: Hardin Brothers

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Sound and CD

Many CDROM players can also play audio CDs when you aren't accessing the player as a disk drive. The player I'm using right now has jacks for output to headphones and to an audio amplifier. There is something very pleasant about a peripheral that can play Mozart as I type and turn into a huge writer's reference shelf when I need help. All I have to do is eject the audio CD, insert the data CD, and run a simple program.

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Author: Hardin Brothers

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Disc Care

One important difference between CDROMs and standard audio CDs is that you must handle CDROMs with extreme care. They are as susceptible to data damage and data loss as a standard floppy disk without a protective sleeve. If you lose a few 1's and 0's to a dirty fingerprint on an audio CD, you probably won't hear the difference. But if you destroy the 1's and 0's that are part of an executable file stored on a CDROM, the program probably won't run at all.

To protect the discs, manufacturers of CDROM players have replaced the disc tray that is used in audio CD players with a special caddy. You place the CDROM in the caddy and then place the entire caddy in the player. The caddy has a sliding metal door that looks and works much like the metal door over a 3.5inch disk.

You can use one caddy for all your CDROMs, carefully loading and unloading them as you need them. But it is much wiser to buy a separate caddy (for a mailorder price of \$10 each) for each disk that you use frequently, and one extra caddy for infrequently used CDROMs and audio CDs. The individual caddies will do a lot to protect your investment in CDROMs.

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Gateway Into Multimedia

If you want to explore the booming world of interactive multimedia; combine traditional applications with previously impossible enhancements or extras (like Microsoft's Word plus Bookshelf disc or CorelDRAW!'s gigantic bundle of drawing and presentation tools and clip art); lose yourself in the richest, most entertaining games yet; or tap into nearly unlimited stacks of reference works and business databases there's never been a better time to buy a CDROM drive. More models at lower prices are reaching the direct channel every day. Best of all, adding a CDROM is one of the simplest PC upgrades available.

From: Computer Shopper, Feb 1993 v13 n2 p374(3)

Author: Eric Grevstad

Full Text COPYRIGHT Coastal Associates Publishing L.P. 1993

Picture This: Family Album on ROM

Kodak's Photo CD is one of the most intriguing applications to spin off a CDROM disc. To take advantage this technology, which allows you to "develop" your photographs onto disc, you'll need a CDROM drive that supports the XA (eXtended Architecture) format. Be careful, for there are different levels of support for Photo CD. Full Photo CD compatibility comes from those drives that support "multisession" XA or Photo CD. "Single-session" drives only let you access photographs placed on the disc during the first pressing. "Multisession" drives, on the other hand, let you access photographs added to the disc later on.

Author: David A. Harvey

Full Text COPYRIGHT r&d technologies 1994

Making Sense of Specs

A muddle of standards and terms can make it difficult to discover the right drive to buy. While the glossary can help you understand these terms, there are really very few specifications that you'll need to be concerned with. Most important is to get a CDROM drive that will allow you access to today's best applications. The bottom line is to get an MPC Level 2-certified SCSI-based drive with support for multisession Photo CD.

Author: David A. Harvey

Full Text COPYRIGHT r&d technologies 1994

In or Out?

A major decision is whether to buy an internal or external drive. Internal drives are cheaper than external ones, but they're also a little more difficult to install. If you go with an internal drive, you'll have to have an empty half-height 5.25-inch drive bay. You'll also have to make sure that your power supply has a free drive connector and cable so that the CD drive can draw its power from there. If you buy an external drive, check the length of the cable that connects the CD drive to its interface board. Cables less than a foot and a half make it hard to place the CD player properly.

Whether you go with an internal or an external drive, you'll still have to install an add-in card that interfaces your PC to the CD player. If your existing system is stuffed with add-in cards and peripherals, make sure that the add-in card allows you to set it to an IRQ that is not in use in your system. The add-in card will probably be either a SCSI interface or an interface that is proprietary to the CD player.

From: Computer Shopper, July 1993 v13 n7 p644(1)

Author: Preston Gralla

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Power Concerns

Most CDROM drives get their power from a wall outlet, via a power supply inside the drive's case or an external supply similar to a laptop's AC adapter. A few draw power from the PC itself only a few watts, no sweat for today's desktops' power supplies, though an internal PCpowered drive won't work unless your power supply has an unused disk drive cable and connector or you can install a cable splitter.

From: Computer Shopper, Feb 1993 v13 n2 p374(3)

Author: Eric Grevstad

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What's in the Bundle?

Also, make sure that the price you see includes everything needed to install the drive and not just the drive itself. If you don't want to install an addin card, you can use one of the models that attach through your computer's parallel port. These slower drives can be taken with you on the road and plugged into your portable. However, not all are up to MPC standards. At some point, you're going to use your CD player to play sound and music, so it will undoubtedly come with a headphone jack. Make sure that it also has two RCA jacks that allow you to plug stereo speakers into it, or you'll be limited to listening on a headphone.

From: Computer Shopper, July 1993 v13 n7 p644(1)

Author: Preston Gralla

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Caddy Check

Finally, check out how a CD gets loaded into the CD drive. Some load like an audio CD: They're put onto a tray. Others require that the CD first be put into a caddy, which has the benefit of protecting the disc and the drive itself. But cumbersome caddies can be awkward to use, especially if you use many different CDs. Your best choice, whichever type you use, is to find a CD player with an extra set of doors or a seal that keeps out dust and protects the drive.

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Software Support

Before you can use your CDROM drive, you'll need to complete a simple, twopart software installation. One part is a hardware-specific device driver, to be added to your CONFIG.SYS file. The other part is MSCDEX.EXE, Microsoft's extension to MSDOS that lets DOS commands such as DIR or TYPE work with the new storage device. Both are supplied with any CDROM drive.

The only other software you'll need are the CDROMs themselves. A vendor's or manufacturer's choice of bundled discs is a big factor in rating packages' value. Uptodate reference works or applications you'll truly use score higher than generic demos or aging games.

From: Computer Shopper, Feb 1993 v13 n2 p374(3)

Author: Eric Grevstad

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Buying for the Future

What about future compatibility access to not only all of today's ISO 9660 discs, but tomorrow's even more interactive or animated CDROM software? If the first set of initials to look for when buying a CDROM drive is MPC Level 2, then the second is CDROM XA.

XA stands for Extended Architecture, a specification created by Sony, Philips, and Microsoft that governs audio compression and allows interleaving of audio and computer data. Not many discs take advantage of XA yet, but those that do will be closer to true multimedia than their predecessors. IBM has been an early backer of CDROM XA, supporting the specification as part of its Ultimedia product line. Other drive makers have either recently released XA ready drives or announced XA upgrade strategies (some costly makeovers, some simple ROM chip replacements). Today's most important XA application is Kodak's Photo CD technology, which lets users store photographic images on CDROM.

From: Computer Shopper, Feb 1993 v13 n2 p374(3)

Author: Eric Grevstad

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Questions for the Dealer

How Fast Is It?

Does It Use a SCSI or Proprietary Interface?

Is Driver Software Included?

CD-ROM To Go

How Fast Is It?

CDROM access times have been cut from the 800ms of a few years ago down to 280ms for topdrawer drives today. If you can afford it, buy a sub300ms drive. Throughput of most CD players is 150K per second, the MPC standard, and also the throughput required to play music on CDs. While that is fine for audio, it's slow when you're accessing data or image information instead of audio information. To get around the problem, some drives use "multispin" technology: They spin twice as fast when accessing data or images instead of audio, and, by doing so, double the throughput from 150K to 300K. The NEC CDR84 and CDR74 CD players both use multispin. If you can afford it, buy a multispin drive.

From: Computer Shopper, July 1993 v13 n7 p644(1)

Author: Preston Gralla

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Does It Use a SCSI or Proprietary Interface?

Most new CDROM drives use SCSI controller cards, although a few still use proprietary interfaces. Avoid proprietary drives, they limit you to the manufacturer's technology (and prices) and are typically slower than SCSI drives. Check to see whether the controller is included; if not, it could add several hundred dollars to the total cost.

From: PCComputing, April 1992 v5 n4 p282(1)

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Is Driver Software Included?

The drive should include device drivers from the manufacturer not allow it to recognize the controller card. You'll need Microsoft's CDROM extension drivers (MSCDEX), which let DOS work with the manufacturer's drivers. The drive should include MSCDEX Version 2.2, which is required for multimedia and many newer applications.

From: PCComputing, April 1992 v5 n4 p282(1)

Full Text COPYRIGHT ZiffDavis Publishing Co. 1992

CDROM To Go

The exceptions are drives that plug into parallelport adapters, such as Trantor Systems' popular paralleltoSCSI adapter, instead of into interface boards. This Walkmanstyle approach is the only way to use a CDROM with a laptop or notebook PC, though it may not prove up to multimedia performance standardsparallel adapters aren't as fast as bus interfaces.

From: Computer Shopper, Feb 1993 v13 n2 p374(3)

Author: Eric Grevstad

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Before You Start

Before you install anything at all, hardware or software, be sure that you have a recovery disk from which you can boot. Format a disk, put your copy of DOS on it either with the Format/s command or by running the SYS utility, and make a copy of COMMAND.COM. Copy your CONFIG.SYS and AUTOEXEC.BAT files onto the disk, but give them new extensions like CONFIG.SAV and AUTOEXEC.SAV so that they won't run. Put a simple text editor on the floppy, and whatever minimal programs you need to boot your computer. Write a simple CONFIG.SYS and AUTOEXEC.BAT for the floppy disk. Then make sure you really can boot your system from the floppy disk.

Now make a printout or a handwritten copy of all the information your computer shows when you run its setup program, especially the hard drive type number. Once you have this floppy disk and setup information in hand, you can recover from anything except a severe electrical or mechanical breakdown. If something goes wrong, you can reboot and recover your system in a few minutes with this floppy and information. Without them, you may face several hours of work.

From: PC Sources, Jan 1992 v3 n1 p553(4)

Author: Hardin Brothers

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Manual Togetherness

Keep the installation and hardware manuals for all peripherals, chips, and cards together, so you can find them. In each manual, mark the options and jumper settings, if any, that you have used. Make notes to yourself. What seems obvious today won't be easy to understand next month.

From: PC Sources, Jan 1992 v3 n1 p553(4)

Author: Hardin Brothers

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Know Thy System

Keep a list, like the one I couldn't find, of the computer resources you have assigned to each peripheral. This might be as simple as noting that your mouse is connected to COM2, or as complex as noting the IRQ, DMA channel, memory block, and I/O address used by a board. You don't want to have to figure out all that stuff six months later when it's time to install something new.

From: PC Sources, Jan 1992 v3 n1 p553(4)

Author: Hardin Brothers

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Note Changes

In the same vein, keep a record of the changes in CONFIG.SYS and AUTOEXEC.BAT that each peripheral and application wants you to make or makes for you. What do the options do, and why have you selected certain ones? If you need to uninstall something, this list will tell you what changes you should make to those files.

From: PC Sources, Jan 1992 v3 n1 p553(4)

Author: Hardin Brothers

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Seek and Ye Shall Learn

If you can find one, cultivate a good hardware guru who will give you advice and moral support. This might be a friend, someone at a user's group, or someone available via an online service like CompuServe. The moral support might be more important than technical advice. You'll feel better if someone you respect tells you you're not a complete klutz.

From: PC Sources, Jan 1992 v3 n1 p553(4)

Author: Hardin Brothers

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Take It Slow

Never let yourself work too fast or take a shortcut. Make sure that you turn off the computer and unplug it before changing cards, that you turn off the monitor before unplugging it from the display card, that you always let the hard drive stop spinning before turning your computer back on (at least 15 seconds), that you never leave a loose screw sliding around inside the computer case, etc. As soon as you start to rush, things will go wrong.

From: PC Sources, Jan 1992 v3 n1 p553(4)

Author: Hardin Brothers

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Set Jumpers

Using your list of system resources as a starting point, along with the adapter card's manuals, find out what the new card needs in the way of IRQs, DMAs, port and memory addresses. Set the card's jumpers to take up unused jumpers in your system. Be careful, some SCSI boards come set to IRQ14, the same IRQ used by your primary hard disk. After setting jumpers and checking twice, add the addresses used by your new card to your system resource list.

Author: David A. Harvey

Full Text COPYRIGHT r&d technologies 1994

Avoid Conflict

If the SCSI card takes up a memory address, and you use a memory manager (like NetRoom or QEMM), be sure to exclude the card's memory from the memory manager. The best install programs will do this for you, but there are many cases where you'll have to manually exclude the memory. Usually, a statement on the memory manager's DEVICE= line in CONFIG.SYS like X=YYYYZZZZ (where Y and Z are the addresses) will do the trick.

Author: David A. Harvey

Full Text COPYRIGHT r&d technologies 1994

Open the Case

Disconnect all cables (including the power cable) from the back of your computer. Next, unscrew the screws on the back of the case and slide the cover off. Inside, you'll see (usually to the left of the power supply in a desktop case) some adapter cards, and some free slots. On the back of the computer, aligned with each free slot, is a slot cover. Unscrew the screw that holds the slot cover in and pull it up.

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Plug and Play

All that's left is to push the adapter into the slot (taking care that you have the right kind of adapter for your system) making sure it's aligned so that the metal bracket with a cutaway tab (for the slot cover screw) is aligned with the slot at the back of the computer and the goldedge connector is positioned directly over the socket. Push firmly, but gently, until you feel the card seat itself.

Author: David A. Harvey

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Set the CDROM's SCSI ID

Set the SCSI ID. A SCSI ID number identifies every device the SCSI card talks to. Setting two devices to the same ID will cause communication problems. Verify that the CDROM drive has a unique SCSI ID. All the SCSI adapters listed in the table include a utility that displays the ID of each attached device and shows device assignments during system bootup. If you don't have one of these kits, check the hardware for the settings.

* To change the CDROM SCSI ID, use jumpers, DIP switches, or a dial on the CDROM, depending on your setup.

* These are typical ID settings:

hard drive 0 ID=0

hard drive 1 ID=1

SCSI adapter ID=7

CDROM ID=4,5 or 6

From: PCComputing, Oct 1993 v6 n10 p162(3)

Author: Adam Meyerson

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Terminate Yourself

Check the terminating resistors. A terminating resistor is a connector that caps the signal at each end of the SCSI chain. All devices come with their own. You need to verify that the devices located at both ends of the bus are terminated. Without proper termination, some or all of the devices won't be recognized by the SCSI.

- * Remove the terminating resistors from devices that are no longer at the end of the chain, and terminate the devices that are now at the end of the chain.

- * If the CDROM is your only SCSI device, then you probably won't have to change anything.

- * Be on the lookout for external terminators. Pass-through connectors that have connectors for both the device and the cable, these terminators are usually not installed at the factory.

From: PCComputing, Oct 1993 v6 n10 p162(3)

Author: Adam Meyerson

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For Internal Drives

Assuming you've already located a free 5.25-inch halfheight slot, and have drive mounting rails (narrow pieces of metal or plastic that attach to the sides of the CDROM drive), then all you need to do is attach the rails, slide the drive into the slot, and, using mounting screws, fasten the drive within the drive cage.

Connect the Cable

Attach the cables. Attach the CDROM to the SCSI adapter using the standard 50pin SCSI cable. Internal cables are supplied with the SCSI adapter. You must purchase external cables separately.

* Attach the power cable to the CDROM.

* For internal drives, use any free power connector in the system

From: PCComputing, Oct 1993 v6 n10 p162(3)

Author: Adam Meyerson

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Close the Case

For an internal drive, make sure that the cable is seated firmly and that the power connector is attached to the drive. Check all cable connections twice. Make certain you've secured the adapter by attaching the mounting screw. Close the case. Screw it back in and reattach all your cables.

Load the Software

Your system needs three pieces of software to access a CDROM drive: Microsoft CDROM Extensions (MSCDEX.EXE), Advanced SCSI Programming Interface (ASPI), and a devicespecific driver. Fortunately, a few companies provide all the software in a single kit and automate the installation. We took apart the top four kits and ran them through our usability tests. Once you've selected the kit that has the driver for your CDROM, follow these installation steps:

Load an ASPI manager in CONFIG.SYS. Developed by Adaptec and adopted as an industry standard, ASPI is an interface that talks directly to the SCSI hardware and manages communication between the SCSI adapter, device drivers, and CDROM drive. ASPI also improves performance by 15 to 20 percent by copying the SCSI adapter BIOS from ROM into RAM. SCSI adapter kits include specialized ASPI managers, and their names vary.

* Syntax:

```
Device = path aspimgr.sys
```

From: PCComputing, Oct 1993 v6 n10 p162(3)

Author: Adam Meyerson

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Device Drivers

Load the device driver in CONFIG.SYS. A CDROM device driver is either a single driver that supports all CDROM drives or a set of specific device drivers for each individual drive. The driver name and commandline options for the device driver and audio vary with the supplier.

* Syntax:

```
Device=path cddriver.sys /D:device name
```

From: PCComputing, Oct 1993 v6 n10 p162(3)

Author: Adam Meyerson

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MSCDEX

Load MSCDEX.EXE from AUTOEXEC.BAT or from the command line. MSCDEX.EXE is an extension of the DOS file system that is now included in MSDOS 6.0. It allows DOS to treat a CDROM as a logical drive with directories and files. Several switches must be set in order to make DOS, the CDROM, and the devicespecific driver communicate.

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Author: Adam Meyerson

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Related Topics:

[MSCDEX Syntax:](#)

MSCDEX Syntax:

MSCDEX.EXE path /D:device name /L:drive letter /M:number of cache buffers
/V /E

* /D:CDROM The device name, CDROM, must match the name assigned to the drive in Step 5. For example, Adaptec's default is

/D:ASPICD.

* /L:E The drive letter (E: in this case) must be the next available drive letter in your system. Most kits default to E:, assuming two hard drives, C: and D:, in a system. On a network installation, the default is Z:, assuming F: through Y: for network drives.

* /M:12 Sets the number of cache buffers. The default number is 12. Each buffer uses 2,048 bytes of RAM. If you have the extra available RAM, you can improve performance slightly just by increasing the number of cache buffers. However, we recommend that you use Norton's Speed Cache Plus if you want to significantly improve your performance.

* /V Displays the version of MSCDEX installed (optional argument).

* /E Use expanded memory if available for cache buffers (optional).

From: PCComputing, Oct 1993 v6 n10 p162(3)

Author: Adam Meyerson

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Ready, SetCheck It First

First, reboot your system. If the CDROM drive is properly installed, you should be able to log on to it as you would to any other disk drive. Under Windows' File Manager, the CDROM drive icon is slightly different from the other drive icons; it shows a tiny CDROM disc sliding in the drive. Now, where in the world did Carmen Sandiego go . . . oops, I mean where's that disk of 800 numbers

From: PCComputing, Oct 1993 v6 n10 p162(3)

Author: Adam Meyerson

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Troubleshooting

[Address Conflicts](#)

[No Audio](#)

[Can't Play an Audio CD](#)

[Memory Problems](#)

Address Conflicts

If you get a message like "Can't find the CDROM," make sure you don't have another ISA card using the same memory address, interrupt request line, or DMA channel. Even though your kit's installation software can scan your system for available resources, it can only advise you of hardware conflicts, not eliminate them. You might have to reset some jumpers on your cards to get them to work. Using bundled DOS utilities like MEM and MSD (in your DOS directory) can give you a snapshot of which system resources are allocated to each device, making this task easier.

As a last resort, remove all other ISA cards from your system, and reinstall them after your new kit is installed.

From: Computer Shopper, April 1994 v14 n4 p196(8)

Author: Steven C.M. Chen

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No Audio

Make sure that power, data, and audio cables are seated properly, and that the data cable between the sound card and CDROM drive is seated with pin 1 aligned between the cable and the two connectors. Pin 1 is colored on one side of the cable and marked by an arrow or 1 on the board and the drive. Also make sure that the audio cable between the CDROM drive and the sound board is connected. Finally, verify that the speakers are connected to the output, not input, jack of the sound board.

From: Computer Shopper, April 1994 v14 n4 p196(8)

Author: Steven C.M. Chen

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Can't Play an Audio CD

Windows' CD Audio driver is not installed. Use the Control Panel to add this driver. Afterward, make sure you exit Windows or reboot so that the new driver changes are recognized.

From: Computer Shopper, April 1994 v14 n4 p196(8)

Author: Steven C.M. Chen

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Memory Problems

Because your CDROM's drivers are loaded when your system boots, you might find that the driver constrains your system's conventional memory. In this case, create an edited version of your AUTOEXEC.BAT and CONFIG.SYS files with all references to CDROM and sound card drivers disabled. Then create a batch file that swaps normal and edited configuration files to your root directory.

From: Computer Shopper, April 1994 v14 n4 p196(8)

Author: Steven C.M. Chen

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Adaptive Differential Pulse Code Modulation (ADPCM)

An audiocompression method that stores the amplitude difference between successive digital samples instead of the raw sample data. Because ADPCM permits some data loss, it is often called "lossy compression." A component of CDROM XA (see below), recommended in the MPC Level 2 spec.

From: Computer Shopper, Nov 1993 v13 n11 p178(8)

Author: Tom Yager

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Books

CDROM standards are described in several industryaccepted manuals identified by color.

Related Topics:

[Green Book](#)
[Orange Book](#)
[Red Book](#)
[Yellow Book](#)

Green Book

Green Book defines CDInteractive (CDI), an entire hardware and software standard developed by Philips for use in its consumer line of CDI players. CDI discs may contain a mix of audio, video, and text that can be "streamed" in synchronicity. Note that both multisession Photo CD and CDROM XA (see below) use parts of the Green Book standard.

From: Computer Shopper, Nov 1993 v13 n11 p178(8)

Author: Tom Yager

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Orange Book

Orange Book covers writeonce, multisession media like Photo CD. It makes no provision for the drives themselves.

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Author: Tom Yager

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Red Book

Red Book covers compact disc digital audio (CDDA), or standard CD audio, the same format as music compact discs.

From: Computer Shopper, Nov 1993 v13 n11 p178(8)

Author: Tom Yager

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Yellow Book

Yellow Book describes the way data is physically organized on data CDROMs, taking into account pits and lands, sector size, the spiral arrangement, and the speed at which data is read. Yellow Book CDROM applications may be PC or Macintoshcompatible, although a growing number of discs contain separate software "engines" to run on both platforms seamlessly. The vast majority of CDROM applications are Yellow Book.

From: Computer Shopper, Nov 1993 v13 n11 p178(8)

Author: Tom Yager

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CDROM Extended Architecture (CDROM XA)

Originally backed by Microsoft, the XA standard combines elements from several books, most notably the Green Book. ADPCM compressed digital audio can quadruple the audio capacity of an XA disc. XA also permits the interleaving of audio, video, and arbitrary data like text, which a compatible player will play in proper synchronicity. Special software drivers, as well as hardware on the drive or controller, are generally required, though the hardware has yet to be finalized in the industry.

From: Computer Shopper, Nov 1993 v13 n11 p178(8)

Author: Tom Yager

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Compact DiscRecordable (CDR)

CDR machines that press discs in one or more sessions used to be the sole domain of plants that manufacture software and music discs. What cost \$75,000 a few years ago now sells in enduser incarnations for under \$4,000.

From: Computer Shopper, Nov 1993 v13 n11 p178(8)

Author: Tom Yager

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ISO9660

The international fileformat standard for most of today's CDROMs. It is an updated version of the High Sierra Format, which was developed in 1985 and later adopted by the International Standards Organization.

From: Computer Shopper, Nov 1993 v13 n11 p178(8)

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Related Topics:

[Kodak Photo CD](#)

[Multisession](#)

[Multispeed](#)

[Modes 1 and 2](#)

[MPC Level 2](#)

Kodak Photo CD

Based on the Orange Book standard, Photo CDs store digitized 35mm photographs recorded at Kodak processing centers. Some early CDROM XA drives were Photo CDcompatible, since XA and Photo CD share some aspects of the Green Book standard. Today's Photo CD drives are all multisession (see below) and not necessarily XAcompatible, though once XA hardware is defined, highend CDROM drives are likely to be compatible with both XA and multisession Photo CDs.

From: Computer Shopper, Nov 1993 v13 n11 p178(8)

Author: Tom Yager

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Multisession

Older CDROM drives can only read the first recorded session on a disc, while multisession drives can access data across all available sessions. Most of today's CDROM drives use multisession primarily to read Photo CDs that have been written to more than once.

From: Computer Shopper, Nov 1993 v13 n11 p178(8)

Author: Tom Yager

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Multispeed

This describes a drive's ability to spin the disc at two different speeds. The faster rotation typically doubles the average datatransfer rate of a CDROM drive by sending more data to the buffer in a given amount of time. Multispeed drives automatically switch between modes, slowing down in the case of Red Book audio, since the data is recorded to play back properly at 150K/sec.

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Modes 1 and 2

This refers to the organization of data in a sector. Mode 1 employs error correction to ensure that data is always retrieved accurately. Mode 2, used for audio and video, forsakes error correction since errors do not necessarily render such data ineffective. Mode 2 data degrades "gracefully." Each "track" on a CDROM must be comprised entirely of data recorded in one mode or the other. Mode 2 is further split into Form 1 (corrected) and Form 2 (uncorrected), allowing for the interleaving of corrected and uncorrected data in alternating sectors on the same track. This lets XA drives "stream" text, audio, and video data together in synchronicity. MPC Level 2 requires the support of all modes and forms.

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Author: Tom Yager

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MPC Level 2

An MPC Level 2-compliant CDROM drive is one that supports multispeed (spinning the disc at two or more times faster than a standard CDROM) with a rated datatransfer rate of 300K/sec (double speed) in the faster mode required. Average seek time must be under 400ms. Finally, this spec throws its weight behind XA and multisession, but fails to require support for compressed ADPCM audio.

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Author: Tom Yager

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Making Windows Sing: A Primer

The First Whispers

For years, PCs were practically mute. The only sounds they could muster were the anemic tones of an underpowered dimestore speaker. While the original Ad Lib and Sound Blaster boards brought sound to computer games, only recently has desktop sound meant business, thanks to improved audio capabilities, competitive pricing, and the sound support built into Windows 3.1. Not only can you add sound to presentations, you can use the verbal equivalent of PostIt notes -- voice recordings that you can attach or embed in documents or spreadsheets. Voice annotations can enhance productivity by letting you add questions, comments, or emphasis by clicking on a sound icon. And by incorporating comments into the document itself, you no longer have to leave telephone messages on colleagues' answering machines. In addition, by merging the message with the medium, you spare users from having to open a file to see the changes you're referring to in a message before they can reply.

Today, more than 3 million PCs are equipped with audio capabilities. Some systems ship with builtin audio capability, such as Compaq's Deskpro/I and multimedia PCs from vendors such as CompuAdd and Tandy, while other systems are augmented with sound ports that attach to a parallel port, or sound boards that plug into an expansion slot on your PC.

From: Windows Sources, May 1993 v1 n4 p382(41)

Author: Chris DeVoney

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The Sounds of Computing

The rest of us, however, remain mired with underwhelming factorybased audio capability. To record and replay voice annotations on systems not equipped with sound capabilities, you'll need thirdparty sound ports or sound boards, a microphone, and an analog sound system. The key, however, is finding the equipment to meet your needs. For example, one problem is making the audio that you record personal or public, as the task demands. In a networked environment, for example, that means making sure everyone can play what you record.

A second and perhaps more pressing consideration if you are planning to purchase a sound board is this: While almost any sound product works for speech, some boards fall short if you need the additional audio required by other Windows applications such as presentations and multimedia. For example, in addition to its ability to handle voice annotation, Windows 3.1 can process other types of audio.

From: Windows Sources, May 1993 v1 n4 p382(41)

Author: Chris DeVoney

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Windows Sounds

The most basic Windows sound is the plaintive beeping of the computer's builtin speaker. The second type is waveform audio; the third is MIDI (Musical Instrument Digital Interface); and the fourth is Compact Disc Digital Audio (CDDA, nicknamed "Red Book" audio), which is the audio replayed on millions of standard compact-disc audio players.

From: Windows Sources, May 1993 v1 n4 p382(41)

Author: Chris DeVoney

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Related Topics:

[Wave Audio](#)

[MIDI](#)

[CD Audio](#)

Wave Audio

However, the most popular sound choice is waveform audio -- which includes voice annotation -- in which the computer acts as a digital tape recorder. Frequently called digitized or sampled sound, sound waves are transformed into data by an analog-to-digital converter (ADC), processed and stored by the computer, and changed back to sound by a digital-to-analog converter (DAC). Some audio systems use a codec (coder/decoder) that replaces the ADC/DAC circuitry. Others use a digital signal processor (DSP) as the dedicated intelligence for audio that helps unburden the CPU during recording and playback.

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This is essentially the same technology used to create audio CDs or digital audio tape (DAT), except the information is stored in DOS file format (the files have the extension WAV). The MPC Level 2 spec includes minimum requirements for digital audio performance: 16bit sampling at 44KHz for recording, and the ability to play back 8bit samples at a 22.05KHz rate.

From: Computer Shopper, Jan 1993 v13 n1 p612(4)

Author: Alfred Poor

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Related Topics:

[Frequency of Sampling](#)

[Big Files](#)

Frequency of Sampling

The sampling frequency determines how often the board measures the level of the sound being recorded or played back. We'll skip the math for now, but the bottom line is that you have to sample at about twice the highest frequency that you want to produce, plus an extra 10 percent to keep out unwanted extra signals. The generally accepted limit for human hearing is about 20,000 cycles per second, or 20KHz. Double it, add 10 percent, and you get 44KHz -- almost exactly the 44.1KHz sampling rate used by highfidelity stereo audio-CD recordings.

The other part of the sound specification is the number of bits per sample. An 8bit sample is only capable of describing 256 steps between the quietest and loudest sounds in a file, which in audio terms is known as the dynamic range. This works out to just 48 decibels. Newer audio cards are capable of 16bit sampling, however, which doubles the dynamic range to 96 decibels. This increased range is sufficient to handle everything from near silence to a salvo from a full symphony at pointblank range.

From: Computer Shopper, Jan 1993 v13 n1 p612(4)

Author: Alfred Poor

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Big Files

Keep in mind that the amount of storage required for a sound file goes up dramatically as you improve the sound quality. At 11.025KHz sampling rate, an 8bit file eats up 0.66MB per minute -- and that's only for one track. Make it a stereo recording, and the requirements double. Raise the sampling rate to 22.05KHz, and they double again. Move up to CD Audio quality and 44.1KHz, and they double again. Increase the sample size to 16bit, and you've doubled the space requirement once more. If you're keeping score, one minute of stereo 16bit sound sampled at 44KHz takes up a whopping 10.6MB. The 500MB capacity of a CDROM begins to look pretty attractive about now. Note that this final number also requires that you be able to read and write the information at more than 170K per second, which is why you need a powerful PC to handle highend digital audio tasks.

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Author: Alfred Poor

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MIDI

The second sound format supported by MPC sound cards is MIDI, which stands for the Musical Instrument Digital Interface. This is a system that uses predefined "voices" to create music. The MPC spec requires the ability to produce three simultaneous voices (each capable of creating six simultaneous notes) and a percussion channel capable of five notes at one time. This is sufficient to create a fourpiece combo with some depth to the sound.

MIDI files have the advantage of being extremely compact, since their contents are more like programs than digitized sound.

From: Computer Shopper, Jan 1993 v13 n1 p612(4)

Author: Alfred Poor

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Unlike Windows' WAV files, which contain digitized sounds, MIDI files contain instructions for playing back music. The continuing trend in MIDI is away from the FisherPrice toy sounds of FM synthesis and toward the more realistic and euphonious wavetable lookup (sampled sound) approach. Inexpensive FM-synthesis chips, like Yamaha's OPL3 synthesizer, use a combination of operators or sine waves -- in Yamaha's case, four -- to recreate the sounds of the different instruments they are instructed to play. Wavetable lookup, on the other hand, uses actual recorded samples of instruments. Wavetable results vary, depending on the number of instruments and notes stored.

Author: John R. Quain

From: PC Magazine, April 12, 1994 v13 n7 p207(26)

Full Text COPYRIGHT ZiffDavis Publishing Company 1994

CD Audio

CD Audio is the type of audio CD you put in your stereo. Audio CDs actually use the same storage format as data CDs used by computers; in fact, you'll find some multimedia CDs that contain both computer data and CD Audio tracks. The advantage of CD Audio is that it sounds great; the disadvantage is that it takes up large amounts of disk space and cannot be translated into a format that can be transferred to a hard disk.

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Author: Alfred Poor

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Choosing a Sound Device

If you need a sound device for your PC, your choices are a sound port or a sound board. A sound port clips on to the parallel port of the computer, while a sound board plugs into an empty expansion slot. The advantage to sound ports is that they're physically easy to install and configure, and they are the only current alternative for portable computers, which don't have expansion slots. The downside to sound ports is that they can monopolize the parallel port (so you can't print without removing the port or using an AB switch). Other shortcomings are that the ports have limited fidelity, and very few can play MIDI music.

Sound boards offer good to excellent fidelity; are easy to use once they are installed; and can double as CDROM, MIDI, and joystick interfaces if you choose the multimedia variety. The downside is that sound cards are the secondmost cantankerous cards to install and configure. (Network cards are often considered the most difficult.) The good news is that sound boards (and ports) come with a variety of capabilities and prices to fit most needs.

From: Windows Sources, May 1993 v1 n4 p382(41)

Author: Chris DeVoney

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Whether you're into serious digital recording or multimedia presentation creation, or simply want cool sounds for computer games, there's a sound board out there to meet your needs. Here are a few of the important elements to consider.

From: Computer Shopper, May 1994 v14 n5 p772(2)

Author: Don Labriola

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Performance

Another common problem is performance, or the lack thereof. Most sound boards use relatively slow DMA (Direct Memory Access) transfers (like floppy drive controllers) to move data over the PC's system bus. On these cards, only a 486 or a 386/33based computer can record and play back 44KHz, 16bit stereo without delays or missed data. Only a few boards use the faster memorymapped I/O, such as the Turtle Beach MultiSound. However, memorymapped I/O can be fooled by 386 memory managers such as EMM386 or QEMM, so keep that in mind before you make a purchasing decision.

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Author: Chris DeVoney

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Playback Is Easy; Recording Is Tough

If you need a sound device, remember that playback is easy, but recording is tougher. To replay voice annotations, the only requirements are an audio device supported by a Windows driver and equipment that can produce the sound. (The only popular device incapable of playing voice annotation is the original Ad Lib sound board, circa 1988/1990.) Even the PC's builtin speaker can play waveforms.

However, recording annotations involves steeper requirements: a Windows driver for the digital recording device, a microphone, and a microphone input. The last item eliminates some parallel port products such as the Disney Sound Source, but most others (such as Media Vision's Audio Port) will work. Fortunately, almost all sound boards (including the original Creative Labs Sound Blaster) have the requisite microphone input and driver.

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Author: Chris DeVoney

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Connections

On the subject of jacks, many sound cards include additional inputs, such as a four or fivepin internal connector for the audio of CDROM players and an external "line input" connector. Since the sound card acts as a mixer of the various sound sources, the additional connectors are helpful for multimedia, but not essential for voice annotations.

Also bear in mind that the number, type, and controls of audio outputs vary from one sound card to another. Look for a card that provides a powered jack for headphones and line output (the latter for connecting to selfpowered speakers or to a regular stereo amplifier). Typically, headphone jacks are powered at 2 to 4 watts per channel at 8 ohms, which is also sufficient for unpowered speakers in a normal office environment.

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Author: Chris DeVoney

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Compression

Compression is the nonstandard standard among sound boards. Many sound port and board makers include some proprietary form of software or hardwarebased compression with their products. Unlike normal data files, audio waveform files do not compress well using generalpurpose compression programs such as Stacker or PKZip.

A special form of compression that removes some sound (and fidelity) works best. Several international telephone standards, such as the European ALaw or North American/Far East MUIaw, are used by several manufacturers. A number of manufacturers use ADPCM (Adaptive Differential Pulse Code Modulation), another form of audio compression. In many cases, sound files compress to one-half to one-fourth of their original size.

Unfortunately, compressing sound files removes some fidelity from the original recording. And softwarebased compression can place a considerable strain on the processor. However, the worst problem is portability. Virtually no sound device plays the files compressed by another device. So for those interested in voice annotation, unless you have standardized on the same hardware or drivers, compressed audio may be unusable.

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Author: Chris DeVoney

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MPC Compatability

For the best overall results, choose a board that conforms to the MPC (Multimedia PC Council) Level 2 (MPC2) specification. Plug-in expansion cards that are compatible with the standard published by the MPC must record and play back waveform audio with 16-bit resolution at 44KHz (this is CD-quality audio, which is far more than you'll need for voice annotation). In addition, boards that comply with the MPC2 specification must be able to play MIDI music, have a joystick port (which can be used as a MIDI interface instead), accept Red Book audio (CD audio) from a CDROM player, and interface with and control a CDROM player. In fact, the lack of a CDROM interface is the major reason why some products are classified as sound boards rather than as MPC2 boards.

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Author: Chris DeVoney

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Synthesizers

Most cards play MIDI files with electronic instruments created through a process known as frequency modulation or FM synthesis. Newer and costlier cards use wavetable synthesis, which provides more realistic sounds by reproducing digital samples or recordings of actual instruments. FM synthesis produces "arcade" quality sound, and is fine if the only MIDI applications you plan on using are games. If you're seriously into audio, want the best reproduction of MIDI, or are interested in creating music with MIDI, then you'll be far better served by a sampled-sound-based synthesiser.

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Author: Don Labriola

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Audio Quality

Sixteenbit cards (meaning those that record 16bit samples, not those that fit in 16bit expansion slots) play and record WAV files with far less noise than their 8bit counterparts. But other factors, such as amplifier design and shielding quality, are just as significant. You'll also need a sample rate as high as 44.1KHz (audio CD quality) if your application demands extended highfrequency response.

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Software

Most boards come with mixer, CD player, digital recorder, and MIDI utilities, but business users will also want voiceannotation or spreadsheetreading applications. If you're a musician, you'll probably need a sequencer or wavefile editor, and multimedia presenters should look for bundled presentation software.

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Goodies and Extras

Better cards include a digitalsignalprocessor (DSP) chip, which can add features like reverb and real-time soundfile compression. Other goodies to watch for include a SCSI2 CDROM interface, which is preferable to a proprietary interface; speakers; and a microphone.

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Author: Don Labriola

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Applied Decisions

With so many options, it's not hard for firsttime soundcard shoppers to feel a bit overwhelmed. Here are some applicationoriented buying guidelines:

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Related Topics:

[Multimedia Presentations](#)

[Music Applications](#)

[CD ROM Multimedia](#)

[Voice Applications](#)

[Games](#)

Multimedia Presentations

Informal presentations can work well with any kind of card, but highprofile multimedia events benefit from 16bit audio and wavetable synthesis. If you make presentations off-site, an external sound unit that plugs into your notebook PC's parallel port instead of a desktop expansion slot is a must. Good examples: DSP Solutions' Portable Sound Plus and Orchid Technology's SoundWave 32.

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Author: Don Labriola

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Music Applications

Low noise levels are crucial for multitrack recording, and if you're arranging MIDI instrumentation, you'll want the best possible synthesizer. Good examples: Roland's RAP10 and Turtle Beach's MultiSound Monterey.

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Author: Don Labriola

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CDROM Multimedia

Midpriced cards work fine with most interactive CDROM titles. Look for a CDROM interface, a goodsounding synth, and 16bit audio. Good examples: Creative Labs' Sound Blaster 16 SCSI2 with ASP upgrade and Media Vision's Pro Audio Studio 16.

From: Computer Shopper, May 1994 v14 n5 p772(2)

Author: Don Labriola

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Voice Applications

Software is the key for applications like voice annotation and spreadsheet proofreading. Speech doesn't require high sample rates, 16bit stereo, or wavetable synthesis, but you'll need solid OLEcompliant utilities. Good examples: Logitech's SoundMan Wave and Microsoft's Windows Sound System.

From: Computer Shopper, May 1994 v14 n5 p772(2)

Author: Don Labriola

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Games

Even the least expensive boards will suffice for games, so long as they run under both DOS and Windows, and support a standard like Ad Lib, General MIDI, MPC Level 2, or Sound Blaster. Good examples: Creative Labs' Sound Blaster Deluxe and Media Vision's Pro Audio Spectrum 16 Basic.

From: Computer Shopper, May 1994 v14 n5 p772(2)

Author: Don Labriola

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Sound Glossary

PC users looking at sound boards may see some unfamiliar terms. Here are definitions of some terms commonly used in discussions of sound boards.

From: PC Week, Sept 28, 1992 v9 n39 p110(1)

Author: Alan Freedman

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Related Topics:

[Analog to Digital Converter \(ADC\)](#)

[Video for Windows \(VFW\)](#)

[Audio/Video Interleaved \(AVI\):](#)

[Digital to Analog Converter \(DAC\)](#)

[Digital Video Interactive \(DVI\)](#)

[Dynamic Filtering](#)

[Musical Instrument Digital Interface \(MIDI\)](#)

[MIDI Synthesizer](#)

[Pulse Code Modulation \(PCM\)](#)

[Sampling](#)

[Sampling Rate](#)

[Sequencing Software](#)

AnalogtoDigital Converter (ADC)

A converter that turns sound frequencies into digital information.

From: PC Week, Sept 28, 1992 v9 n39 p110(1)

Author: Alan Freedman

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Video for Windows (VFW)

Microsoft Corp.'s video standard that will bring digital video offering 160by120dotperinch, 15framepersecond resolution to the MPC environment.

From: PC Week, Sept 28, 1992 v9 n39 p110(1)

Author: Alan Freedman

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Audio/Video Interleaved (AVI):

The prerelease name for Microsoft's Video for Windows, AVI is the file extension used by VFW files.

From: PC Week, Sept 28, 1992 v9 n39 p110(1)

Author: Alan Freedman

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DigitaltoAnalog Converter (DAC)

A converter used to turn digital information into sound waves.

From: PC Week, Sept 28, 1992 v9 n39 p110(1)

Author: Alan Freedman

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Digital Video Interactive (DVI)

A technology from Intel Corp. for compressing and decompressing data, audio, and fullmotion video.

From: PC Week, Sept 28, 1992 v9 n39 p110(1)

Author: Alan Freedman

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Dynamic Filtering

This helps eliminate electronic emissions from the PC that can show up as noise in the sound-board output.

From: PC Week, Sept 28, 1992 v9 n39 p110(1)

Author: Alan Freedman

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Musical Instrument Digital Interface (MIDI)

A protocol for the interchange of musical information among musical instruments, synthesizers, and sound boards.

From: PC Week, Sept 28, 1992 v9 n39 p110(1)

Author: Alan Freedman

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MIDI Synthesizer

This allows an external MIDI device such as a musical keyboard to connect to the sound board, compose music, and store it on a PC.

From: PC Week, Sept 28, 1992 v9 n39 p110(1)

Author: Alan Freedman

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Pulse Code Modulation (PCM)

The process of changing sound waves into digital information and back again.

From: PC Week, Sept 28, 1992 v9 n39 p110(1)

Author: Alan Freedman

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Sampling

Recording and playing back sounds.

From: PC Week, Sept 28, 1992 v9 n39 p110(1)

Author: Alan Freedman

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Sampling Rate

In digitizing operation, the frequency with which samples are taken and converted. The higher the sampling rate, the truer the representation in digital form.

From: PC Week, Sept 28, 1992 v9 n39 p110(1)

Author: Alan Freedman

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Sequencing Software

This is used to handle entire multiinstrument compositions, not just single notes.

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Author: Alan Freedman

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Hints and Tips

[Attach Sounds to Events](#)

[Play a Music CD](#)

[The PC Speaker Speaks](#)

[Stuck Sounds](#)

[Sounds of Silence](#)

[File Formats Explained](#)

[Built-In Sound Tools](#)

[Making Windows MIDI](#)

[Sound Card Installation](#)

[No Sound When Playing MIDI Files](#)

["Cannot Play Select Sound"](#)

[Control Volume](#)

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Attach Sounds to Events

Are you sure you want to? That Beavis and Butthead sound clip might be fun the first time, but after a week or two, the novelty wears thin -- for you and for everyone within earshot.

Still, some Windows system events benefit from the judicious application of a sound clip. For example, you can replace the default beep with a louder, more distinctive sound -- that way you'll get unmistakable feedback when it's time to swap disks during a lengthy installation.

To attach sounds to system events, open the Control Panel and doubleclick on the Sound icon. System events are listed on the left side of the dialog, available WAV files on the right. By default, the dialog lists only WAV files in the Windows directory, but you can browse through other directories in search of sound clips, too. Highlight the system event and a matching sound clip, then click on the Test button to preview the sound. Make sure the Enable System Sounds box is checked, then press OK.

If you want to work in peace and quiet, deselect the Enable System Sounds box. Be aware that two system events -- Windows Start and Windows Exit -- play their attached WAV sounds regardless of the status of that checkbox. To turn off those two sounds, you must associate them with the <none> option.

From: PCComputing, May 1994 v7 n5 p180(3)

Author: Ed Bott

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Play a Music CD

Do you have a 16bit sound card (8bit sound cards don't sound as good) and external speakers? Do you have a CDROM drive? Does the CDROM drive support audio CDs? If the answer to all three questions is yes, you should have no problem making your PC compatible with any music CD.

If it's not already installed, you'll need to add the Media Control Interface (MCI) CD Audio driver. First, put an audio CD into the CDROM drive. (This step is crucial for the CD Audio driver to install properly.) Doubleclick on the Control Panel's Drivers icon, click on the Add button, and select CD Audio. Windows will prompt you for the original installation disk that contains MCICDA.DRV. After this driver installs properly, start Media Player (you'll find it in the Accessories group) and select Device. CD Audio should be one of your choices.

If it's not, use Notepad to check the CDAUDIO line in MPLAYER.INI. The line should read something like CDAUDIO=17, CDAUDIO. If this value is set to 0, it means Media Player couldn't recognize the CD Audio device, and it's time for some troubleshooting:

- * Can you read a nonaudio CDROM? If not, check the connections to the drive.
- * Is your CDROM drive connected to the sound card? You may need to run a stereo headphone extension cable between the CDROM drive's output and your sound card's stereo linein jack.
- * If you receive an error message that says, "There is an undetectable problem loading the specified device driver," that's probably a sign that you need to update the MSDOS CDROM Extensions (MSCDEX.EXE).
- * Can you play a WAV file using Media Player? If not, the problem is with the sound subsystem, not the CDROM.

The PC Speaker Speaks

It really does, although the results vary from surprisingly good to fingernailsonchalkboard screechy, depending on your system. Microsoft makes a generic sound driver that works with a PC's internal speaker, but it hasn't shouted that fact from the rooftops. The PC Speaker files aren't on your original Windows disks, so you must download them from the Microsoft Driver Library (CompuServe: GO MSL). You'll get enough waivers and disclaimers to bring tears to an attorney's eyes. Ignore them -- you can't harm your PC with this addin.

To install the driver, doubleclick on the Control Panel's Drivers icon and press the Add button. Choose Unlisted or Updated Driver, and specify the disk or directory where the PC Speaker files are located. By default, the PC Speaker driver disables all interrupts while playing sounds. That makes for better sound quality, but it also freezes the mouse, keyboard, serial ports, and other interruptdriven processes while the PC speaker is playing a sound. To enable interrupts for serial-port activity and mouse movements, select the checkbox in the PC Speaker setup dialog box.

Also note that the Windows 3.1 Media Player doesn't play WAV files when the PC Speaker driver is installed. (Instead, you'll need to use Sound Recorder, found in the Accessories group.) And when the PC Speaker driver is installed, you can't play MIDI files at all.

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Author: Ed Bott

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Stuck Sounds

Here's another problem: If your sound card gets stuck playing one syllable, you haven't slipped into the Minimalist Composer Zone -- you probably just have an IRQ conflict. When the sound card's interrupt is set incorrectly, the sound driver plays only the first 2K of data in the sound file, over and over again. In some instances, your system can lock up. Here's what to look for to prevent that from happening:

* Make sure the sound card's interrupt is correctly specified in the Control Panel's Drivers dialog box. (Highlight the sound card's driver and click the Setup button to get there.) Look for IRQ conflicts. Creative Labs' Sound Blaster Pro cards, for example, typically default to IRQ 5, while Media Vision Pro Audio Spectrum cards use IRQ 7. You could run into a conflict with the IRQ being used by a parallel port or a network card.

* The repeating sound problem may also occur when the jumper setting on the sound card and the interrupt specified in the driver are not the same.

* If you're certain the driver settings for the sound card are correct, but WAV sounds still repeat, the problem may be caused by a defective parallel port card. One of these can lock the interrupt lines so that the controller cannot receive interrupt signals from the sound card.

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Author: Ed Bott

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Sounds of Silence

If you don't hear sounds from Windows, there are at least four things to check:

- * First, make sure the sound card works in DOS. If it doesn't, the problem is probably physical. Check that the card is seated properly, that the volume control (if any) is turned up, and that the connections to external speakers are firm.
- * Check the Control Panel to see whether system sounds are available. If you doubleclick on the Sounds icon and all your choices are grayed out, reinstall the Windows sound driver. While you're there, make sure the necessary WAV files are in your Windows directory.
- * Did your sound card come with a mixer? Even if it has a volume-control knob, there may be a software utility that lets you adjust volume, bass, treble, and other output settings. (Sound Blaster owners use SBMIXER.EXE; for the Pro Audio Spectrum, look for PMIX.EXE.) If the volume is set too low here, that explains the silence.
- * Finally, a direct memory access (DMA) conflict can cause digital audio to be distorted or not to play at all. It can also cause your system to lock up, spontaneously reboot, or generate parity errors. To change the DMA setting, use the Setup dialog of the Control Panel's Drivers utility.

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Author: Ed Bott

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File Formats Explained

WAV: The standard format used by Windows for digital audio files. Virtually all sound cards support it.

VOC: The Sound Blaster format conversion utilities translate these files to WAV format for use in Windows.

AIF: Audio Interchange Format, a crossplatform digital audio file format supported by Windows, Macintoshes, samplers, and other devices.

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Author: Fred Davis

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Built-In Sound Tools

Windows includes a Sound Recorder utility, which lets you record, edit, and play back digital audio WAV files -- provided you have the required sound hardware. The sound files you create can be embedded in or linked to applications that support object linking and embedding (OLE) and can be assigned to system events, such as Windows startup or exit.

From: PCComputing, Nov 1993 v6 n11 p250(4)

Author: Fred Davis

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Making Windows MIDI

When you play a MIDI file, the computer sends MIDI the messages contained in the file to a MIDI instrument, which converts the messages into the sounds of a specific instrument, pitch, and duration. To acquire MIDI files, you can purchase preprogrammed MIDI music or record your own compositions. The MIDI Mapper utility that comes with Windows allows you to configure MIDI synthesizers and other devices to conform with either the Standard MIDI or MPC MIDI formats that work with Windows. Sound cards that support MIDI are typically more expensive than those that handle just digital audio. (For details, see "The Lowdown on Sound" below.)

From: PCComputing, Nov 1993 v6 n11 p250(4)

Author: Fred Davis

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Sound Card Installation

I just installed a new sound card. Why won't it work with Windows?

If the card isn't recognized or if your system freezes up, you may have an interrupt conflict. Use the Microsoft diagnostic program MSD.EXE (included with Windows and DOS 6.0) or a similar utility to investigate the status of the interrupts in your system.

Also, check the documentation to determine how to set the card for one of your unused interrupts. If all your interrupts are already used up, you have to remove something else to free one for the sound card.

If the card is recognized by your applications and its own utilities, it's probably OK. If that's the case, check your various cables, then check the audio-output system. To check your audio output, just plug your headphones directly into the sound-output port to see if it is sending out sound.

From: PCComputing, Nov 1993 v6 n11 p250(4)

Author: Fred Davis

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No Sound When Playing MIDI Files

My machine appears to be playing MIDI files in Microsoft's Media Player, but there's no sound.

Many popular sound cards, such as the Sound Blaster, the Sound Blaster Pro, and the Pro Audio Spectrum, come with an internal synthesizer and an external MIDI port. The Windows 3.1 MIDI Mapper utility lets you play MIDI sound files on one or both of these devices. If no external sound device (such as a synthesizer or drum machine) is connected to the sound card's MIDI port and that port is selected in the MIDI Mapper, applications may appear to play MIDI files, but no sound is heard. Verify that the proper port name is selected in the MIDI Mapper Setup dialog box. If no external MIDI device is connected to the sound card's supplied port, select the appropriate driver for the internal MIDI Synthesizer.

From: PCComputing, Nov 1993 v6 n11 p250(4)

Author: Fred Davis

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"Cannot Play Select Sound"

I'm getting the message "Cannot play the selected sound" with some WAV files but not with others.

Sometimes you'll get this message -- or no message and no sound -- when you play certain WAV files using the Sound section of the Control Panel. That's because the Sound option plays only 22.05KHz WAV files -- it won't play 11.025KHz WAV files. However, Sound Recorder plays both 11.025KHz and 22.05KHz WAV files and saves files only in 22.05KHz format.

To play the 11.025KHz WAV files, check the following:

First, make sure the sound functions are working by playing a sound from the Windows directory. If this does not work, you have driver or hardware problems -- check your soundcard setup.

Otherwise, you can then load the WAV files into the Sound Recorder. Save them in 22.05KHz format so that you can play the file using the Control Panel's Sound utility.

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Author: Fred Davis

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Control Volume

You can adjust the volume of sounds associated with system events by increasing or decreasing the volume in the Sound Recorder applet and then saving the file. The sound plays at the new volume from the Sound option in the Control Panel.

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Author: Fred Davis

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Sound Quality

As a guideline for evaluating the quality of sound files, 8bit/11.025KHz sampling (recording) is roughly equivalent to AM radio quality. The 8bit/stereo/22.05KHz sampling is comparable to FM radio quality, and the 16bit/stereo/44.1KHz sampling provides quality equivalent to that found on audio compact discs. The quality of the digital sound depends on your sound card, the quality of the microphone or other sound source, the size of the sample (8 or 16 bits), and the sampling rate at which the sound is digitized.

From: PCComputing, Nov 1993 v6 n11 p250(4)

Author: Fred Davis

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Installation Guide

[Prepare the Board](#)

[Crack the Case](#)

[Find a Slot](#)

[Making Connections](#)

[Powered Speakers](#)

[Into the Stereo](#)

Prepare the Board

Once you've selected the necessary products, you're ready to begin the upgrade. The first step: Make the sound board is properly set up to coexist with other peripherals inside your PC.

With a new sound board, this may mean selecting IRQ numbers, a base address, or DMA channels that don't conflict with other devices. Most boards come preconfigured to use an otherwise idle set of ports, but problems occasionally arise. Troubleshooting may mean changing board jumpers or switches, or even reconfiguring other installed peripherals.

From: PC Sources, Jan 1993 v4 n1 p218(7)

Author: Winn L. Rosch

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Crack the Case

Once your sound board is properly prepared, get your PC ready for the installation. Switch off your system, and disconnect its power cable. If you also unplug all the other cables running from your system, you'll find it easier to work on. Mark where each was connected, so you can replace it later without confusion.

Turn the system around so that its rear panel faces you, and remove the screws that hold down the top of the case. Then turn it around again so that the machine faces you, and slide the lid of the case forward and off.

From: PC Sources, Jan 1993 v4 n1 p218(7)

Author: Winn L. Rosch

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Find a Slot

Scout your system for a vacant expansion slot and drive bay to use for your upgrade. Most sound boards use 8bit interfaces and fit comfortably in any fulllength expansion slot. However, you may reduce unwanted noise in the audio by putting the board as far as possible from electrical elements that generate noise -- in particular, the power supply and hard drive. If possible, move other expansion boards away from the sound board.

Scout the connections. If the cable from the CDROM player mates with a connector on the side of the sound board, you'll probably want to link things together before sliding the board into its slot.

Hold the sound board in one hand over its designated slot; slide in the audio and control cables, then push the board into its slot. Screw the retaining bracket of the board into the rear of your computer.

From: PC Sources, Jan 1993 v4 n1 p218(7)

Author: Winn L. Rosch

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Making Connections

Once you've finished making the connections inside your PC, you can plug speakers or your stereo system into the audio outputs of the sound board. Some sound boards have enough output power to drive loudspeakers directly, albeit at low volume.

But you'll get better results if you plug the sound-board outputs into powered speakers -- that is, speakers with built-in amplifiers -- or into your stereo system.

From: PC Sources, Jan 1993 v4 n1 p218(7)

Author: Winn L. Rosch

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Powered Speakers

Powered speakers come in several styles, and a growing number designed specifically for multimedia are available. Some are individual satellite speakers that you can place anywhere; others come preinstalled in a cabinet that matches the case of your PC, fitting between it and your monitor.

Ordinary powered speakers, the kind that you might plug into a Walkmanlike portable stereo, also work with multimedia systems, but you may need an adapter cable to match the jack on the sound board to the plugs that are on the speakers.

From: PC Sources, Jan 1993 v4 n1 p218(7)

Author: Winn L. Rosch

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Into the Stereo

If you already have a stereo and want to connect your multimedia system directly to it, check the plugs and jacks at both ends of the connection. Most stereos use pin plugs -- also called RCA or phono plugs -- for input.

Although pin plugs are standard on some sound boards, other use miniature phone plugs, which require an adapter.

Hooking up your stereo to a sound board is simply a matter of sliding the plugs into jacks. If your sound board gives you a choice of outputs -- speaker or lowlevel -- choose the lowlevel outputs for a stereo connection.

Connect this output to the auxiliary input of your stereo receiver, preamp, or integrated amplifier. If your stereo doesn't have an auxiliary input, other input options include (in order of preference) tuner, CD, or Tape 2. Do not use phono inputs, however, because the level and equalization of the signals will be mismatched.

A word of warning: Before trying out your sound board for the first time, turn down the volume on your receiver to prevent surprises and blown speakers. Barely turn up the volume control; then select the proper input on your stereo receiver, and boot up your PC.

From: PC Sources, Jan 1993 v4 n1 p218(7)

Author: Winn L. Rosch

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Setting Up Windows Right

by Herb Chong

This material originally appeared in the Windows Sources Forum on ZiffNet.

Okay, so you're running Windows but want to know a little more about what's under the hood, what's driving things. The following Guide to Setting Up Windows Right gives everything you'd ever want to know about the switches, knobs and gears that control Windows -- and let you control it even better.

Introduction

Windows 3.1 uses two initialization files to define your Windows environment and system hardware -- WIN.INI and SYSTEM.INI. In addition to getting Windows set up the way it should be, some Windows applications use the settings in these two files to configure themselves to your system and your preferences. Other Windows programs also create their own INI files; the Windows Program Manager creates and uses a file called PROGMAN.INI.

The initialization files for Windows itself have these purposes:

- WIN.INI - configures the Windows environment to your preferences
- SYSTEM.INI - configures Windows to your system's hardware

This guide describes the more important settings in each of these two files, what they do, why you might want to change them, and their default and recommended settings. Most of the settings described are ones that you most likely will want to verify or change for your system.

Format of INI Files

Each Windows INI file contains several sections of related settings. Each section looks like the following:

```
[section name]
```

```
keyname=value
```

In this example, [section name] is the name of a section. Windows requires the enclosing brackets ([]) and the opening bracket must be in the first column of the line in the INI file.

Each section contains zero or more keyname=value settings. A keyname is the name of a setting. It can consist of any combination of letters, digits, and blank spaces. Windows allows certain special characters too, but uses very few in its settings. The keyname ends with an equal sign (=). Each value can be an integer, a string, or a quoted string.

You can include comments in INI files. Each comment line begins with a semicolon (;). Although not as useful in WIN.INI, comments can help remind you what each of the many devices drivers in SYSTEM.INI mean.

The total size of any INI file cannot be greater than 64KB. If you add too many comments or don't clean out INI file settings after removing Windows applications, you can exceed this limit. When the file size exceeds the limit, Windows and Windows applications can behave unpredictably.

If a section appearing in WIN.INI or SYSTEM.INI is not described here, then it is an application or device driver created section. You must consult the documentation for the application or device driver to find the settings and what they do.

Hint: Blank lines are also ignored by Windows when it reads INI files. You can insert blank lines between sections to make your INI files more readable.

Reading the Setting Descriptions

Each setting is laid out as in the following example:

SettingName=<value-type>

Purpose: This paragraph describes the function of the setting.

Default Value: This is Windows' built in value for this setting.

Recommended Value: This optional paragraph describes appropriate values for the setting and under what circumstances you may want to change it.

Change by: This paragraph describes the recommended way to change the value of this setting.

Notes: This optional paragraph describes other things that may be important about the setting and the possible consequences of using an incorrect value.

The <value-type> shows whether the value should be a number, a letter, a range of numbers, or something else.

Related Topics:

[Changing the INI files](#)

Changing the INI files

Control Panel changes many settings in WIN.INI. If it handles the setting you want to modify, using it is safest. Most settings changeable from Control Panel take effect immediately. You can also load the INI file into Notepad or some other text editing application and manually modify the settings. Changes made this way will not take effect until you force Windows to reread the INI file. Usually this means exiting and restarting Windows.

The Windows Setup application modifies many settings in SYSTEM.INI. Changing video, mouse, keyboard or network drivers usually requires several simultaneous setting changes. Unless you are comfortable with making changes yourself, it is safer to use Windows setup for these settings. Most of the settings described here are ones that are not handled by Setup and must be modified using Notepad.

Hint: In the \WINDOWS\SYSTEM directory, there is a program called SYSEDIT.EXE. It is the Windows System Configuration Editor. You should install this program into Program Manager. It makes making changes to the various configuration files on your system easier to do. When you launch it, it loads your CONFIG.SYS, AUTOEXEC.BAT, SYSTEM.INI, and WIN.INI files into separate Notepad-like edit windows. You can then change whichever files you need to and save them from it instead of using Notepad on each file separately.

WIN.INI

The WIN.INI file controls most of the environment that you see when you work in Windows. These include how Windows looks and gives feedback to you, how Windows applications act when you perform certain actions, and printer device connections.

General Windows 3.1 Configuration

The [windows] and [extensions] sections define to Windows how parts of the interface work and the associations of documents to applications. The [windows] section is the oldest configuration section in the Windows operating environment. This means that diverse settings exist in it because no better home was available.

Related Topics:

[\[windows\]](#)

[\[extensions\]](#)

[\[mci extensions\]](#)

[\[embedding\]](#)

[\[programs\]](#)

[windows]

The [windows] section contains settings that control the basic appearance of the Windows environment and how Windows treats documents. That the section is a potpourri of settings is mostly historical. Before Windows 3.0, WIN.INI controlled almost all aspects of the Windows environment. With Windows 3.1, the remaining settings that have no other home appear here.

Related Topics:

BorderWidth=<number>

CoolSwitch=<0 or 1>

DoubleClickHeight=<pixels>

DoubleClickSpeed=<milliseconds>

DoubleClickWidth=<pixels>

Load=<filename(s)>

Programs=<extensions>

Run=<filename(s)>

ScreenSaveActive=<0 or 1>

ScreenSaveTimeOut=<seconds>

Spooler=<yes or no>

BorderWidth=<number>

Purpose: Sets the width of the borders around all the resizable windows on your desktop.

Default Value: 3

Recommended Value: For standard VGA and lower resolutions, use the default of 3. For 800x600 or higher resolution displays, try 5 or higher. Increase as necessary for higher resolutions to make a comfortably-sized border you can click on to resize windows. The allowed range of values is 1 to 49.

Change by: Choose the Desktop icon from Control Panel.

CoolSwitch=<0 or 1>

Purpose: Turns fast task switching on or off. When off, ALT+TAB brings up the entire application window of the next task to show what is next. When this setting is 1, only a bar appears with the window title and icon of the next application.

Default Value: 1

Recommended Value: It is much faster to switch between applications using ALT+TAB if CoolSwitch is on. Set the value to 1. When 0 is set, switching tasks causes the next task to redraw all of its windows. For most applications, this is not too slow, but for drawing or CAD applications, it may take several minutes. Usually, the window title is enough to decide whether the next application is the one you want.

Change by: Under the Desktop icon in Control Panel, select or clear the Fast ALT+TAB Switching checkbox.

DoubleClickHeight=<pixels>

Purpose: Specifies the height in pixels that the mouse pointer can move between clicks in a double-click. If the mouse pointer moves more than this amount vertically between clicks, the two clicks get treated as separate single clicks.

Default Value: 4

Recommended Value: If you are running a very high resolution screen driver or you have your mouse set to very high sensitivity, increasing this value may help you double click more consistently.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

Notes: Microsoft documents that if you enter an odd number, Windows rounds it up to the next even number.

DoubleClickSpeed=<milliseconds>

Purpose: Sets how long between clicks on the mouse button before two clicks become separate single clicks.

Default Value: 452

Recommended Value: Use the Control Panel's Mouse icon to change the value until you are comfortable with double-clicking. The value which is appropriate for you is highly personal. Experiment.

Change by: Choose the Mouse icon from Control Panel.

DoubleClickWidth=<pixels>

Purpose: Specifies the width in pixels that the mouse pointer can move between clicks in a double-click. If the mouse pointer moves more than this amount horizontally between clicks, the two clicks get treated as separate single clicks.

Default Value: 4

Recommended Value: If you are running a very high resolution screen driver or you have your mouse set to very high sensitivity, increasing this value may help you double click more consistently.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

Notes: Microsoft documents that if you enter an odd number, Windows rounds it up to the next even number.

Load=<filename(s)>

Purpose: Specifies one or more programs that will run minimized when Windows starts.

Default Value: None

Recommended Value: This value lists one or more application program names or documents that are associated with an application, each separated by a space. If the programs or documents are not in your path, then you must specify the complete path. Unless you have a specific requirement to have these programs or documents load before Program Manager completes initialization, add the application to the Startup Group of Program Manager instead. Then select the Minimize on Use checkbox in the Properties dialog box for the icon.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

Programs=<extensions>

Purpose: Defines to Windows the extensions that it should regard as applications. You must list the extensions without the preceding periods.

Default Value: com exe bat pif

Recommended Value: Ensure that the default values are specified.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

Notes: Upgrading from older versions of Windows sometimes left the PIF extension off. When this happens, it prevents you from running DOS applications via their PIF file.

Run=<filename(s)>

Purpose: Specifies one or more programs that will run when Windows starts. The programs will start but will not appear as icons initially.

Default Value: None

Recommended Value: This value is a list of one or more application program names or documents that are associated with an application, each separated by a space. If the programs or documents are not in your path, then you must specify the complete path. Unless you have a specific requirement to have these programs or documents load before Program Manager completes initialization, add the application to the Startup Group of Program Manager instead.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

ScreenSaveActive=<0 or 1>

Purpose: Determines whether or not the Windows screen saver displays if you leave your system unattended.

Default Value: 0

Recommended Value: If you are using only the Windows supplied screen savers, use 1. When you use another Windows screen saver and it does not have an interface to the Windows screen saver modules, use 0. If your Windows screen saver has an interface to the Windows one, decide how you want to start your separate screen saver.

Screen savers are nowhere near as important as they used to be with CGA and EGA monitors. VGA monitors are much more resistant to burnin than the older types. Nonetheless, you usually want to have a screen saver because burnin can still occur. Also screen savers provide some amount of security if you must leave your system unattended where someone else can sit in your place.

Change by: Choose the Desktop icon from Control Panel.

ScreenSaveTimeOut=<seconds>

Purpose: Sets how long that Windows must be idle before the screen saver starts.

Default Value: 120

Recommended Value: The default is usually much too short. Just sitting and reading something on your screen may take long enough to have the screen saver start. For most people, a more appropriate value lies between 300 and 600 seconds.

Change by: Choose the Desktop icon from Control Panel.

Spooler=<yes or no>

Purpose: Enables or disables sending printer output through Print Manager.

Default Value: Yes

Recommended Value: Disabling Print Manager gives the shortest total time from beginning to print until the finished document appears, but you cannot use or switch to another Windows application until the printing finishes. With Print Manager enabled, you regain control of your application more quickly, but it takes longer from when you began printing until the output completes. The advantage is that you can do other work on your computer while the file prints. Unless you need the fastest print speed, leave Print Manager enabled.

Change by: Choose the Printers icon from Control Panel and enable or disable the Use Print Manager checkbox.

[extensions]

The [extensions] section controls the association of document file extensions to applications. Although Windows 3.1 still uses this section, newer applications use the Object Linking and Embedding (OLE) registration database to associate file extensions with applications. The OLE registration database has precedence over the [extensions] section of WIN.INI. If the same extension appears in both the [extensions] section of WIN.INI and the OLE database, the OLE database information overrides.

Related Topics:

<extension>=<command line>

<extension>=<command line>

Purpose: Associates file extensions that identify a document with the command line needed to read the document when you choose a file that has the associated extension.

Recommended Value: The <extension> keyname is a standard DOS file extension of one to three characters. The <command line> value is an ordinary DOS command line. A typical entry in this section might be

pcx=pbrush.exe ^.pcx

You will want to edit or add settings in this section if you change or add extensions of documents. For instance, suppose all your Word for Windows document files have the WRD extension instead of the standard DOC extension. You have to change the association here before double-clicking on a WRD file in File Manager automatically launches Word for Windows with the document loaded.

Change by: Choose Associate from the File menu in File Manager.

[mci extensions]

The [mci extensions] section of WIN.INI works like the [extensions] section except that the extensions listed here are used only by the Windows Multimedia high level Media Control Interface devices. You should never have to modify the settings in this section.

[embedding]

The [embedding] section lists the association between objects and servers used by OLE. Each entry lists the object name, description, the program file of the executable file used to create and edit the object, and the format of the object. Windows uses this section of WIN.INI only as a backup to the OLE registration database (REG.DAT) should it become corrupted.

Hint: You should never modify this section by directly editing it. Instead, use the Registration Info Editor (REGEDIT.EXE) to modify the contents.

[programs]

The [programs] section lists the additional paths used by Windows to search for program files when you try to open a document file that has an association in the OLE registration database but File Manager or Program Manager can't find the program file. This can happen if you install an OLE-aware server application and then you move it to another directory without de-installing it first. The settings in this section allow you to tell Windows where the application now resides.

Hint: Although this section can fix problems of moved applications, you are better off to learn how to use the OLE Registration Info Editor. Use it to modify the registration database to point to the new location of the applications or to remove and reinstall them. All the parts of Windows that track where things are then remain up to date.

Appearance and Sounds

An advantage of the Windows environment is that all its applications have similar look and feel. This extends to the desktop itself and its appearance. The [desktop] and [fonts] sections manage the desktop appearance. The [fonts] section also manages the typeface used for system functions such as menus and window titles.

Related Topics:

[\[desktop\]](#)

[\[intl\]](#)

[\[Windows Help\]](#)

[\[sounds\]](#)

[\[color\]](#)

[desktop]

The [desktop] section controls the Windows desktop appearance and the positioning of windows and icons on the screen. Control Panel changes most settings through the Desktop icon, but there are several useful ones that are not in Control Panel.

Related Topics:

IconSpacing=<pixels>

IconTitleFaceName=<fontname>

IconTitleSize=<number>

IconTitleStyle=<0 or 1>

IconTitleWrap=<0 or 1>

IconSpacing=<pixels>

Purpose: Specifies the number of pixels that will appear horizontally between icons.

Default Value: 77

Recommended Value: The default is appropriate for VGA screens, but is too crowded for higher screen resolutions. A value of 96 is more appropriate for 800x600 resolution, and 120 for 1024x768. Setting this value very high for long icon titles is not important anymore since in Windows 3.1, icon titles can wrap onto more than one line of text. See *IconTitleWrap* for more information.

Change by: Choose the Desktop icon from Control Panel.

IconTitleFaceName=<fontname>

Purpose: Specifies the font used for displaying icon titles.

Default Value: MS Sans Serif

Recommended Value: Use the default value. If you really want to change this setting, choosing a bitmapped typeface such as MS Serif will have faster screen updates than using a TrueType or other scaleable typeface. On a VGA or a very large display, you might want to try Small Fonts if your eyes are good, as its largest size is 7 points.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

IconTitleSize=<number>

Purpose: Specifies the size of the font used to be used for displaying icon titles.

Default Value: 8

Recommended Value: For VGA displays, use the default value. For higher resolution displays, you may want to try a smaller size, depending on the size and quality of your monitor.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

IconTitleStyle=<0 or 1>

Purpose: Specifies whether the icon titles are bold or not.

Default Value: 0

Recommended Value: Use the default unless you have a large monitor running at high resolution and use a small title size, or you are using a typeface which is normally very light.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

IconTitleWrap=<0 or 1>

Purpose: Specifies whether the icon titles are wrapped onto more than one line if they are too long.

Default Value: 1

Recommended Value: Use the default value unless you have IconSpacing set to a very high value and have a high resolution display adapter with a large monitor.

Change by: Choose the Desktop icon from Control Panel.

Notes: When IconTitleWrap is set to 1, Microsoft documents that icon vertical spacing is increased by 3 lines. It is not clear whether the 3 lines assumes some IconTitleSize setting or the actual height of the current icon title typeface.

[intl]

The [intl] section controls the appearance of dates, times, currency amounts and other items that change depending on the country you are in. All of the settings in this section are changed by choosing the International icon from Control Panel.

[Windows Help]

The [Windows Help] section controls the appearance of the Windows 3.1 Help window and the text that appears in it. The important settings are the ones that control text color. Depending on your display adapter, monitor, and screen device driver, special Help text displayed using the Microsoft defaults can be hard to distinguish from each other or regular text with the default colors.

Each of the color values are integers from 0 to 255. Windows and the screen device driver convert the RGB triple into the nearest available color and uses it. For example, pure red is 255 0 0.

Related Topics:

JumpColor=<red value> <green value> <blue value>

PopupColor=<red value> <green value> <blue value>

MacroColor=<red value> <green value> <blue value>

IFJumpColor=<red value> <green value> <blue value>

IFPopupColor=<red value> <green value> <blue value>

JumpColor=<red value> <green value> <blue value>

Purpose: Sets the color of text that, when chosen, leads to a new panel of help information.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

PopupColor=<red value> <green value> <blue value>

Purpose: Sets the color of text that, when chosen, displays a popup panel.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

MacroColor=<red value> <green value> <blue value>

Purpose: Sets the color of text that, when chosen, runs a Help macro.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

IFJumpColor=<red value> <green value> <blue value>

Purpose: Sets the color of text that, when chosen, leads to a new panel of help information located in a different help file.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

IFPopupColor=<red value> <green value> <blue value>

Purpose: Sets the color of text that, when chosen, displays a popup panel in a different help file.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

[sounds]

The [sounds] section lists the sound files associated with Windows system events. You should never need to edit this section of WIN.INI directly. Instead, choose the Sounds icon from Control Panel to modify them. You must have a device driver installed that can play WAV format sound files before you can hear sounds from system events.

[color]

The [color] section holds the color definitions for the standard elements of the Windows user interface. You should never need to edit this section of WIN.INI directly. Instead, choose the Colors icon from Control Panel to make changes. It's more convenient, as you see the effects of changes immediately.

Fonts

There are three types of typefaces directly recognized by the Windows operating environment: bitmapped, vector, and TrueType. If you have a third -party typeface scaling program installed, such as Adobe Type Manager (ATM), that program simulates to Windows bitmapped fonts of the necessary characteristics.

TrueType is new in Windows 3.1. Before this version, bitmapped and vector fonts were the only type available. The bitmapped and vector font files have FON as their file extension. TrueType typeface files have TTF as their file extension, but what appears in your WIN.INI are files with the FOT extension. This is a TrueType font resource file. It contains some information about the typeface and the location of the TTF typeface file itself. The FOT file is created by Windows when you install new TrueType TTF files using Control Panel.

Note: Microsoft persists in using the name *fonts* for just about everything to do with typefaces despite their terminology being wrong. What Microsoft calls a font is really a typeface. The two are not identical. Typefaces are organized into typeface families. A typeface family is a collection of typefaces designed with similar style. It can have a progression of design weights from light to dark and can possibly have condensed, expanded, and ornamental variations. A typeface is a single style variation of a typeface family. There can be as few as two typefaces in a typeface family. A font is a single typeface at a single size. Arial is a typeface family. Arial Narrow Italic and Arial Bold are different typefaces. Twelve point Arial Regular is a font.

Related Topics:

[\[fonts\]](#)

[\[FontSubstitutes\]](#)

[\[TrueType\]](#)

[fonts]

The [fonts] section identifies to Windows the typefaces available on your system and the location of the font resource file describing them. It can contain zero or more occurrences of the following setting.

Related Topics:

=

=

Purpose: Identifies the name of a font and the location of the font resource file describing it.

Change by: Choose the Fonts icon from Control Panel.

Notes: If the font resource file name has no path, the file is assumed to be in your \WINDOWS\SYSTEM directory.

[FontSubstitutes]

This section of WIN.INI is supplied to provide compatibility for Windows 3.0 applications running in Windows 3.1. Microsoft chose to change the names of two system typefaces and needed to provide a mechanism to enable these older applications to run and produce an appearance with no surprises. By judicious use of the entries in this section, you can remap typefaces used by older Windows applications to TrueType ones.

Related Topics:

=

=

Purpose: Specifies the typeface to be used by Windows if the one you or your application specifies is not found on the system.

Default Value: Helv=MS Sans Serif

Tms Rmn=MS Serif

Times=Times New Roman

Helvetica=Arial

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

Notes: The substitution happens only if the typeface you specify is not on your system but it is listed as a setting name in the [FontSubstitutes] section. If the requested typeface is not listed here, Windows will use other means to come up with what it will use to display your text.

[TrueType]

The [TrueType] section of WIN.INI describes the settings that control how TrueType works on your system.

Related Topics:

OutlineThreshold=<number of pixels per em space>

OutlineThreshold=<number of pixels per em space>

Purpose: Controls the threshold at which Windows will render TrueType typefaces as outlines instead of bitmapped fonts.

Default Value: 256

Recommended Value: If you are very low on memory but need to use many large typefaces simultaneously, then decreasing this value to about 50 will conserve memory. Doing so will slow down your system. Microsoft says not to specify a value over 300. Apparently, doing so can cause system crashes.

Change by: Use Notepad or SysEdit to edit the WIN.INI file.

Notes: An em space is the approximate width of an upper case M in the typeface you are using. If the size of an em space is larger than the number of pixels specified, the TrueType rendering engine will always regenerate the bitmaps when needed. Otherwise, it saves the bitmaps and reuses them to improve screen update speed.

This setting is apparently used for both printer and screen fonts. At 256 pixels per em for a 1024x768 display translates into a width of just over 2 inches. For many typefaces, a 96-point font will reach the threshold. On a printer at 300 dpi, the threshold is about 36 points for common typefaces.

Printing, Ports, and Network

The [ports], [PrinterPorts], and [devices] sections describe the printers installed in Windows and the ports available. The [devices] section is a remnant of Windows 2.11 carried forth for compatibility.

Related Topics:

[\[ports\]](#)

[\[PrinterPorts\]](#)

[\[devices\]](#)

[\[network\]](#)

[ports]

The [ports] section lists all the ports and files that can be used by the printer devices you have configured on your system. For serial ports, it also defines default communications parameters. This section can contain at most 10 settings. Any more than that number are ignored. The usual settings in the section are: COMx:, EPT:, LPTx.DOS, and FILE:. If you do not have an IBM PagePrinter with its proprietary EPT port, you can delete the EPT entry. Similarly, if you are not on a network and do not have LPT2: or LPT3: ports, you can delete those entries and the corresponding LPTx.DOS ones, too.

Normally, Windows manages the printer ports directly and will read and write to the registers as needed to send output to your printer. If you have a special DOS TSR program or network connection that requires that software control the printer port, you should connect your printer to the correct LPTx.DOS port. Windows will write to LPTx.DOS which DOS then redirects to the proper program to handle the port.

The only time you should need to make a change to this section other than to delete entries is to add a setting to name a specific file that you want to direct your printer output. This usually will be because you do not want to use the special FILE: port that Windows recognizes to print to a file but to always print to a specific file. The contents of this file will be overwritten every time you print to its port. Unlike normal printer ports, a file port name has no colon in it. For example:

DOCUMENT.EPS=

is a valid file port name entry.

[PrinterPorts]

The [PrinterPorts] section lists the printers that are defined to Windows and their current port assignment and time-out values. No changes should be made to this section except through Control Panel.

[devices]

The entries in the [devices] section should be kept identical to the ones in the [PrinterPorts] section except that there are no time-out values. If you make any changes to your printer configurations using Control Panel, it will rewrite the [devices] section to be compatible with the [PrinterPorts] section.

[network]

The [network] section of WIN.INI contains network settings and previous network connections. If you install Windows with a network device driver, you have the option to have network connections restored so that they are the same as they were when you last exited Windows. Normally, you should never have to modify this section as Windows maintains it for you automatically.

SYSTEM.INI

The SYSTEM.INI file contains global system information that Windows uses when it starts. With many settings, incorrect values can cause Windows to lock up at startup or immediately return to the DOS prompt. Sometimes, Windows will start and run, but then crash mysteriously. Be very careful about modifying any parts of SYSTEM.INI and always have a backup of the file to restore from.

Windows Configuration

The sections described here control how Windows operates with your hardware. Settings here affect how Windows and Windows applications work.

Related Topics:

[\[boot\]](#)

[\[boot description\]](#)

[\[drivers\]](#)

[\[keyboard\]](#)

[\[mci\]](#)

[\[standard\]](#)

[\[386Enh\]](#)

[boot]

The [boot] section contains a list of device drivers and Windows modules that are used to configure Windows each time you start it. There are very few reasons for you to modify the contents of this section. Most of the settings are changed by the Windows Setup program. If you need to modify the settings not controlled by Setup, you should refer to the Windows Resource Kit or other similar reference documentation before making changes. Except for the CachedFileHandles setting, all other settings are required and have no defaults. Removing any of the settings will usually result in Windows not starting.

Related Topics:

CachedFileHandles=<number>

Shell=<file name>

Taskman.Exe=<file name>

CachedFileHandles=<number>

Purpose: Specifies the number of file handles Windows will use to keep track of the most recently used executable (EXE) and dynamic link library (DLL) files that can remain open. Windows keeps these files open so that they can be accessed more quickly.

Default Value: 12

Recommended Value: Use the default. Valid values are from 3 to 12. Some networks restrict the number of files that can be open on a single server simultaneously. If you have trouble running Windows or Windows applications from a server, lowering this setting sometimes lets it work.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Shell=<file name>

Purpose: Specifies the Windows program to be run when you start Windows.

Default Value: Windows Setup installs PROGMAN.EXE, but Windows itself has no default.

Recommended Value: Alternate Windows program shells such as Norton Desktop for Windows will install themselves as the Windows shell if you choose to do so. They will set the name of their executable file as the value of this setting. Sometimes, if that program crashes on startup, you may need to change the shell setting to get back to a usable Windows configuration.

Not just any program can be used as your Windows shell. Certain Windows initialization functions are the responsibility of the shell program including executing the programs in the Load= and Run= settings in WIN.INI. Use a program here only if you know it is designed to be a Windows shell program.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Taskman.Exe=<file name>

Purpose: Specifies the task switching program that will run when you press CTRL+ESC.

Default Value: TASKMAN.EXE

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Notes: If you are using a third-party task manager such as Metz Task Manager, you will find its program file name as the value of this setting.

[boot description]

The Windows Setup program uses the [boot description] section to describe the devices you can change when you run it. You should always use it to change the values of the settings in this section. If there is a mistake in this section, Windows Setup will not recognize your device drivers. When that happens, it is much more complicated to install newer versions of Windows device drivers.

[drivers]

The [drivers] section contains a list of aliases assigned to Windows device drivers. This is how Windows device drivers that take parameters receive their parameters. The driver vendor should have provided documentation on what parameters their device drivers take and how to change them. Most installable device drivers are configured via the Drivers icon in Control Panel.

[keyboard]

The [keyboard] section provides information about the keyboard. The Windows Setup program should have set these values correctly and you should never need to manually modify this section. If you must change any, use the Setup program either from Windows or from DOS.

[mci]

The [mci] section lists the device drivers used by the Media Control Interface to play media files. Setup and Control Panel install these settings and drivers. You should never need to edit this section manually. Instead, use the Drivers icon from Control Panel to change or update a device driver listed here.

[standard]

The [standard] section controls how Windows runs in Standard mode. There should be no need to modify any of the settings in this section.

[386Enh]

The [386Enh] section controls how Windows runs in 386 Enhanced mode. With Windows 3.1 on a 386 or higher machine, there is seldom a need to run in any other mode. Because this mode offers many more possibilities for running applications, there are correspondingly more settings to look after. Using improper values for many of these settings will not crash Windows, but you may find that Windows runs very slowly or crashes frequently.

Related Topics:

32BitDiskAccess=<0 or 1>
COMxBase=<address>
COMBoostTime=<milliseconds>
COMxBuffer=<number>
COMxFIFO=<0 or 1>
COMxIRQ=<number>
DOSPromptExitInstruc=<0 or 1>
EMMExclude=<paragraph range>
FileSysChange=<0 or 1>
Local=<device name>
LocalReboot=<0 or 1>
MaxPagingFileSize=<kilobytes>
MinTimeSlice=<milliseconds>
MinUserDiskSpace=<kilobytes>
PageOverCommit=<number>
Paging=<0 or 1>
PagingDrive=<drive letter>
PagingFile=<path and file name>
PermSwapDOSDrive=<drive letter>
PermSwapSizeK=<kilobytes>
PerVMFiles=<number>
VirtualHDIRQ=<0 or 1>
WindowUpdateTime=<milliseconds>

32BitDiskAccess=<0 or 1>

Purpose: Enables or disables use of FastDisk, an Enhanced-mode-only disk device driver that can speed up access to your hard disk.

Default Value: If it appears at all in SYSTEM.INI, then the default is 0.

Recommended Value: If the setting is present, you should set it to 1. Otherwise, don't put it in yourself. Your drive controller hardware must be 100% compatible with a WD1003 disk controller before you can safely use 32-bit disk access. If the setting does not appear in your SYSTEM.INI, don't add it in and enable the setting without taking a full backup first. SCSI and ESDI drive controllers in general do not support 32-bit disk access and any attempt to use it will cause problems. Certain Ultrastor and Future Domain disk controllers are exceptions.

Some portable computers with power management shut off the hard disk after a period of disk inactivity. Often Windows will allow you to turn on the 32BitDiskAccess setting. Be very cautious! The disk controllers often do not shut down so that the controller state is consistent. DOS applications still run because they go through the normal controller BIOS, but Windows with this setting enabled bypasses the BIOS with protected mode code of its own. This code may not restore controller state correctly before trying to access the disk. The result could be a scrambled hard disk.

Change by: Choose the 386 Enhanced icon from Control Panel, choose the Virtual Memory button, and then the Change button in the dialog that appears next. At the bottom of the dialog box should appear the "Use 32-bit Disk Access" checkbox. Check it. If the checkbox does not appear, you should not use 32-bit disk access.

COMxBase=<address>

Purpose: Sets the port address for the named COM port.

Default Value: The standard setting for COM1 is 03F8 and for COM2 is 02F8. There is no standard for COM3 and COM4. You must look up your settings in the manual of the adapter which supplies the COM3 and COM4 ports. A common setting for COM3 is 03E8 and COM4 is 02E8.

Change by: Choose the Ports icon in Control Panel, choose a port, and then the Advanced Settings dialog.

Notes: The settings get used by Standard and Enhanced modes despite these settings appearing in the [386Enh] section of SYSTEM.INI.

COMBoostTime=<milliseconds>

Purpose: Specifies the amount of time, in milliseconds, to allow a virtual machine to process an interrupt on a serial port.

Default Value: 2

Recommended Value: Use the default. If your communications application is losing characters during typing, you can try to increase this value. Doing so will slow down other applications. Increasing this value may also help with file transfers.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

COMxBuffer=<number>

Purpose: Specifies the amount of space to allocate for a buffer on the communications port.

Default Value: 128

Recommended Value: Slower machines need fewer buffers, while higher modem speeds need more buffers. If you are not having problems with lost characters when using your communications program, use the default value.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Notes: DOS communications applications from Windows may still have many file transfer errors no matter what values are used for this setting, because the data can get into the buffers only when the DOS virtual machine runs. This is a limitation of how Windows is designed. You may have to use a third-party communications port driver to get reliable file transfers with a high speed modem and DOS communications applications. If your system's I/O ports do not have 16550 UARTs, replacing them with ports that do will often help, but the results vary widely.

COMxFIFO=<0 or 1>

Purpose: Enables the FIFO buffer in a COM port's 16550 UART. If the COM port does not have a 16550 UART, this setting is ignored.

Default Value: 1

Recommended Value: Always leave the buffer on by deleting these settings from SYSTEM.INI.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Notes: Any value other than 1 turns the UART's buffer off. This is a bug in the communications port driver code. Microsoft did not fix this problem in Windows 3.1. The settings get used in Standard and Enhanced modes despite these settings appearing in the [386Enh] section of SYSTEM.INI.

COMxIRQ=<number>

Purpose: Specifies which interrupt to be used for the COM port.

Default Value: Depends on the machine, but generally IRQ 4 for COM1 and COM3 and IRQ 3 for COM2 and COM4.

Recommended Value: Use the defaults unless your adapter documentation specifies otherwise.

Change by: Choose the Ports icon in Control Panel, choose a port, and then the Advanced Settings dialog. The settings are used in Standard and Enhanced modes despite these settings appearing in the [386Enh] section of SYSTEM.INI.

Notes: If you need to disable a COM port, use a value of -1 as the IRQ number. The settings get used in Standard and Enhanced modes despite these settings appearing in the [386Enh] section of SYSTEM.INI.

DOSPromptExitInstruc=<0 or 1>

Purpose: If enabled when you start the MS-DOS prompt, a message appears in the DOS window with instructions on how to exit and how to switch away from the MS-DOS prompt.

Default Value: 1

Recommended Value: When you have been working with Windows for a while, you know how to exit and switch away, so use 0.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

EMMExclude=<paragraph range>

Purpose: Specifies a range of addresses that Windows will not scan to find unused address space.

Default Value: None

Recommended Value: If there are upper memory addresses that you want to reserve or that Windows cannot correctly detect as adapter ROM or adapter RAM, specify a range here. Valid ranges are between A000 and EFFF. An example is C000-C7FF.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Notes: The procedure used by Windows to scan for adapter ROM or RAM can interfere with some adapters that use the same memory area. Windows rounds the lower value you specify down to the nearest multiple of 16KB and the upper value to the next higher multiple of 16KB. You can specify more than one range to exclude by using more than one EMMExclude setting.

FileSysChange=<0 or1>

Purpose: Specifies whether File Manager should receive notification messages any time a DOS application creates, deletes, or renames a file.

Default Value: 0

Recommended Value: Use the default. File Manager uses the notification messages to update its file windows. While it does so, it can greatly slow other applications running on your system. If you must have File Manager up to date all the time as DOS applications manipulate files, then enable this setting.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Local=<device name>

Purpose: Identifies DOS device drivers that are to appear in each DOS virtual machine.

Default Value: None. Setup will set Local=CON by default.

Recommended Value: Always have at least Local=CON in your SYSTEM.INI. If you are trying to use a mouse in a windowed DOS application, you may need to put Local=PC\$MOUSE or Local=MS\$MOUSE in your SYSTEM.INI along with Local=CON and other changes in SYSTEM.INI.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Notes: If Local=CON is not in your SYSTEM.INI, it is possible that a DOS application writing to the screen will write to another screen instead. Another symptom is that when you type with a DOS application active, another windowed DOS application also receives the same keystrokes.

The device name is case sensitive. It must match the name as used by the device driver to identify itself to DOS. Only certain device drivers will run separately in each DOS virtual machine. If you are not sure, don't use this setting.

LocalReboot=<0 or 1>

Purpose: Specifies whether Windows treats CTRL+ALT+DEL while an application is running as a request to shut down the application or to reboot the machine instead.

Default Value: 1

Recommended Value: Use the default of 1. This allows you to use CTRL+ALT+DEL to shut down a hung Windows or DOS application without rebooting Windows and possibly losing all the data in other open applications.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

MaxPagingFileSize=<kilobytes>

Purpose: Specifies the largest size allowable of a temporary swapfile.

Default Value: 50% of available disk space when Windows is started

Recommended Value: Unless you have special requirements, use the Windows default. You should be using a permanent swapfile instead anyway as a temporary swapfile is slower than a permanent one. If you have lots of free disk space, say 100MB, and insist on using a temporary swapfile, then setting a maximum size of say 20MB will help prevent thrashing of your hard disk.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

MinTimeSlice=<milliseconds>

Purpose: Specifies the minimum amount of time a virtual machine is allowed to run before another virtual machine is run instead.

Default Value: 20

Recommended Value: Using a smaller value will give smoother multitasking but can slow total Windows performance. Using a larger value will cause jerkier multitasking, but there is less Windows overhead. The default is appropriate for a 386 with a 16Mhz processor, but if you have a faster machine, you may want to decrease the value. For a 386/25, a value 5 of is workable.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

MinUserDiskSpace=<kilobytes>

Purpose: Specifies the minimum amount of hard disk space to leave when creating a temporary swapfile.

Default Value: 2000

Recommended Value: Use the default. If you are using a temporary swapfile on a machine with a small hard disk, you may want to change this value so that your applications have enough room to create their data files. This setting is ignored when a permanent swapfile exists.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

PageOverCommit=<number>

Purpose: Controls the multiplier that the Windows Virtual Memory Manager uses to calculate the address space of the system.

Default Value: 4

Recommended Value: Use the default unless you need to work with data that is much larger than your physical RAM. Setting the value higher will allow you to allocate a larger swapfile but incurs more overhead in managing it and causes more paging.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Notes: The maximum linear address space allowed by Windows is found by taking the size of physical RAM rounded up to the next 4MB and then multiplying by this value.

Paging=<0 or 1>

Purpose: Enables the use of virtual memory and the permanent or temporary swapfile.

Default Value: 1

Recommended Value: If you have less than 16MB of RAM, you usually need this to be on. If you have more than 8MB of RAM and usually run few Windows and DOS applications, you should consider turning Paging off. No swapfile is used and there is no overhead for managing Paging.

If you have Paging=0, then you don't need to have space for any swapfile and Windows runs a little faster than with a swapfile. If you run out of RAM, though, then you can't use your hard disk to simulate more RAM to run more applications.

Change by: Choose the 386 Enhanced icon from Control Panel and then the Virtual Memory button in the dialog box that appears. Choose Change in the new dialog box that appears and change the type of swapfile to None.

PagingDrive=<drive letter>

Purpose: Specifies where Windows will try to create a temporary swapfile.

Default Value: The drive where SYSTEM.INI is.

Recommended Value: Your fastest hard drive and never a RAM drive.

Change by: Choose the 386 Enhanced icon from Control Panel and then the Virtual Memory button in the dialog box that appears. Choose Change in the new dialog box that appears and change the paging drive to a valid drive.

Notes: Never page to a RAM drive. If you can afford the RAM for a RAM drive, then you can afford to use that memory for Windows or your disk cache instead.

PagingFile=<path and file name>

Purpose: Specifies the path and file name for the temporary swapfile.

Default Value: \WINDOWS\WIN386.SWP

Recommended Value: Delete the setting from your SYSTEM.INI and use the default.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

PermSwapDOSDrive=<drive letter>

Purpose: Specifies where Windows will create the Enhanced mode permanent swapfile. If you are using a temporary swapfile, this setting is ignored.

Default Value: None

Recommended Value: Use your fastest hard disk drive. If you have more than one drive or partition on the drive, use the one with the most free space.

Change by: Choose the 386 Enhanced icon from Control Panel, then the Virtual Memory button, and finally the Change button.

Notes: The permanent swapfile cannot be on a device driven disk drive. For instance, Stacker drives cannot be used. If you use Stacker or another similar device driver to create drives, you must leave enough space on the physical drive for your permanent swapfile and allocate it there. If you do not leave enough space, then Windows in Enhanced mode must use a temporary swapfile, if you choose to use any.

Windows will normally never use this setting as it will find the permanent swapfile through other means. However, if you somehow manage to get a corrupted permanent swapfile, you can delete it and Windows will recreate it the next time Windows starts in Enhanced mode. To delete the permanent swapfile from outside of Windows, you must delete two DOS files: SPART.PAR in your Windows directory, and 386SPART.PAR in the root directory of the drive containing the permanent swapfile.

PermSwapSizeK=<kilobytes>

Purpose: Specifies the desired size of the permanent swapfile.

Default Value: None

Recommended Value: 4096

Change by: Choose the 386 Enhanced icon from Control Panel, then the Virtual Memory button, and finally the Change button.

Notes: Unless you have a very good reason to choose a different size, use a 4MB permanent swapfile size. Adjust the size upwards if you consistently get Out of Memory messages from Windows, and adjust the size downwards if you never get them. If your system contains 16MB or more of RAM, you probably should think about disabling Paging.

PerVMFiles=<number>

Purpose: Specifies the number of private file handles allocated to each virtual machine.

Default Value: 10; 0 if SHARE is installed

Recommended Value: Use the default value if your DOS application does not have enough file handles to run.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Notes: The total number of file handles allocated by DOS before you start Windows plus the number of private file handles allocated cannot exceed 255. If SHARE is installed, this setting is ignored.

VirtualHDIRQ=<0 or 1>

Purpose: If enabled, Windows in enhanced mode can use its own code to handle hard disk interrupts instead of the ROM BIOS code in the hard disk controller.

Default Value: 1 for AT-compatible computers

Recommended Value: 1 if you have an AT-compatible with MFM, RLL, or IDE drives, 0 otherwise

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Notes: ESDI and SCSI drives generally need to have all interaction with their hard disks go through the ROM BIOS routines on the adapter. If you are running ESDI or SCSI drives and experience an immediate lockup as you try to start Windows, setting VirtualHDIRQ=0 will generally correct the problem.

WindowUpdateTime=<milliseconds>

Purpose: Specifies the minimum amount of time Windows allows between updates of a windowed DOS application.

Default Value: 50

Recommended Value: Use the default. If you have a DOS application that puts out many characters at a time to the screen and the output is too jerky for your tastes, reducing this value will make the output smoother, but will slow other applications as Windows resources are devoted to the application more often.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

DOS Applications

What Microsoft calls a non-Windows application, everyone else calls a DOS application. As an aside, Microsoft is going to get into trouble in Windows NT with this kind of terminology as a non-Windows application to NT can be a DOS or an OS/2 application. Most of the global settings that control DOS applications are found in the [NonWindowsApp] section of SYSTEM.INI. Most of the rest are in PIF files for the applications or in DOSAPP.INI, which is not described here.

Related Topics:

[\[NonWindowsApp\]](#)

[NonWindowsApp]

The [NonWindowsApp] section controls how DOS applications run and their performance. Several settings control the appearance of DOS applications when run in a Window.

Related Topics:

FontChangeEnable=<0 or 1>

MouseInDOSBox=<0 or 1>

ScreenLines=<number>

SwapDisk=<drive:\directory>

FontChangeEnable=<0 or 1>

Purpose: Controls the ability to change the screen fonts of DOS applications running in a window.

Default Value: 1 on systems that are using a Windows 3.1 screen grabber, and 0 on systems that are using a Windows 3.0 screen grabber

Recommended Value: Use the default unless you must run a Windows 3.0 screen device driver and grabber with Windows 3.1 and must have a nonstandard font size for DOS applications running in a window.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Notes: Using Windows 3.0 screen drivers with Windows 3.1 loses many features. Being able to change the screen font for DOS applications running in a Window is one of them. Try to find an up-to-date screen device driver. If you can't and decide to enable this setting anyway, you can start losing characters and Windows may place the cursor incorrectly.

MouseInDOSBox=<0 or 1>

Purpose: Specifies whether a DOS application that supports a mouse and is running in a window should see the mouse or not.

Default Value: 1 if the DOS mouse driver supports use of the mouse in a windowed DOS application. Otherwise, the default is 0.

Recommended Value: If you are using a Windows 3.0 screen grabber and want to use the mouse in a windowed DOS application, you can enable this setting.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Notes: Upgrading to a Windows 3.1 screen device driver with a Windows 3.1 screen grabber is a safer way of getting mouse support in a windowed DOS application. There are several other things that may prevent a DOS application from seeing the mouse, even with this setting enabled.

ScreenLines=<number>

Purpose: Specifies the number of screen lines that will be displayed when a DOS application starts. If the application changes screen modes, it can override this setting.

Default Value: The number of screen lines set for DOS before you started Windows, usually 25.

Recommended Value: If you have a high resolution screen monitor and you feel comfortable with 50 line displays when not running Windows, try 50 lines here to see if you can live with it. You may have to change the Windows screen font used for your DOS application so that the window is sized appropriately.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Notes: Microsoft's and most other documentation are wrong about the default value.

SwapDisk=<drive:\directory>

Purpose: Tells Windows where to swap DOS applications when running in Standard mode and when the TEMP environment variable is not set.

Default Value: The root directory of your first hard disk, usually C:\.

Recommended Value: You should set the TEMP DOS environment variable to the appropriate directory from your AUTOEXEC.BAT file and not modify this setting.

Change by: Use Notepad or SysEdit to edit the SYSTEM.INI file.

Authoring

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

Authoring is the process of using multimedia applications to create multimedia materials for others to view. Multimedia authoring uses many tools, from the more familiar text editor or desktop publishing application, to tools for capturing and manipulating video images or editing audio files. Authors might include specialized creators of training, sales, or corporate applications such as insurance claims processing. Or they might be creators of everyday business communications like voice-annotated E-mail. Over time, everyone involved in business communications will probably have some level of multimedia authoring capability.

AVC

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

(Audio Visual Connection) Multimedia software from IBM that works in conjunction with IBM's Audio Capture and Video Capture boards for the PS/2. It allows users to integrate sound and pictures into applications and includes an authoring language.

AVI

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

(Audio Video Interleaved) Windows multimedia video format from Microsoft. It interleaves standard waveform audio and digital video frames (bitmaps) to provide reduced animation at 15 frames per second at 160x120x8 resolution. Audio is 11,025Hz, 8-bit samples.

CD-ROM XA

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

(Compact Disc Read-Only Memory eXtended Architecture) Microsoft's extensions to CD-ROM that let you interleave audio with data. Though it is not a video specification, limited video can be included on disc. Demand for multimedia applications is increasing the use of CD-ROM XA. To use it, you must have a drive that reads the audio portions of the disc and audio card in your computer that translates the digital into sound. Not all drives can recognize the extensions. (See CD-WO.)

CDTV

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

(Commodore Dynamic Total Vision) CD system from Commodore that combines audio, graphics, and text. Introduced in 1991, it is an interactive multimedia system for the home. The player connects to a TV and also plays music CDs, including CD+Graphics and CD+MIDI.

Collaboration

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

A multimedia term. Collaboration involves two or more people working together in real time, or in a "store-and-forward" mode. Applications will enable a group of people to collaborate in real time over the network using shared screens, shared whiteboards, and video conferencing. Collaboration can range from two people reviewing a slide set online to a conference of doctors at different locations sharing patient files and discussing treatment options.

Communicating Objects

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

A term created in the fall of 1992 by Mitel's vice president, Tony Bawcutt, for a new Mitel division that specializes in making PC printed cards and software drivers and developer tools for those cards. Those cards are designed to be the building blocks of what Mitel calls multimedia applications -- but which are more properly called PC-based voice- and call-processing telecom developer building blocks. One of the first cards Mitel introduced was an ISDN S-access card that converts PCs into ISDN telephones, also called voice and data workstations.

Desktop Media

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

Integration of desktop presentations, desktop publishing, and multimedia (coined by Apple).

Desktop Presentations

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

Creation of presentation materials on a personal computer, which includes charts, graphs and other graphics-oriented information. It implies a wide variety of special effects for both text and graphics that will produce output for use as handouts, overheads, and slides, as well as sequences that can be viewed on screen. Advanced systems generate animation and control multimedia devices.

Device Control

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

A multimedia definition. Device control enables you to control different media devices over the network through software. The media devices include VCRs, laserdisc players, video cameras, CD players, and so on. Control capabilities are available on the workstation through a graphical user interface. They are similar to the controls on the device itself, such as play, record, reverse, eject, and fast forward. Device control is important because it enables you to control video and audio remotely -- without requiring physical access.

DVI

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

(Digital Video Interactive) A name for including still and moving video pictures in material shown on a PC's screen. DVI is part of multimedia. DVI is also Intel's scheme for digitizing and compressing video and audio for storage, editing, playback, and integration into PC applications. Theoretically, with DVI, you'll be able to compress about 70 minutes of video onto a standard CD-ROM.

Editing

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

Editing is a familiar process of changing the content of files to achieve more effective communication by cutting, pasting, cropping, resizing, or copying. Multimedia editing can be done on all types of media: voice annotations, music, still images, motion video, graphics, and text. Tools for editing vary from simple tools for E-mail voice annotations to more sophisticated tools for video manipulation.

Edutainment

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

Unpopular answer to the question "What do you get when you cross educational material with interactive video?" A term coined by "someone who obviously knows nothing about either education or entertainment," says Laura Buddine, president of multimedia games maker Tiger Media.

EPSS

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

(Electronic Performance Support System) Computer system that provides quick assistance and information without requiring prior training to use it. It may incorporate all forms of multimedia delivery, as well as AI techniques such as expert systems and natural language recognition.

Hypermedia

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

A way of delivering information that provides multiple connected pathways through a body of information. Hypermedia allows the user to jump easily from one topic to related or supplementary material found in various forms, such as text, graphics, audio, or video.

Another definition we found is: Non-linear media, of which multimedia can be a form. Just as hypertext is a non-sequential, random-access arrangement of text, hypermedia is a non-sequential, random-access arrangement of multiple media such as video, sound, and computer data.

A third definition: A type of authoring and playback software through which you can access multiple layers of multimedia information related to a specific topic. The information can be in the form of text, graphics, images, audio, or video. For example, suppose you received a hypermedia document about the Sun file system. You could click on a hotspot (such as the words file system) and then read a description. You could then click an icon to see an illustration of a file structure, and then click the file icon to see and hear information in a video explaining the file system.

Information at Your Fingertips

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

At Fall Comdex 1990, Bill Gates, Microsoft's chairman, suggested the idea. With information at your fingertips, he said, PC users can easily access companywide information "anywhere at anytime" through an icon-based graphical user interface. In the speech, Gates demonstrated applications that used Object Linking and Embedding (OLE), Dynamic Data Exchange (DDE), handwriting recognition, cellular communications, and multimedia.

Kaleida

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

The joint venture between Apple and IBM to make multimedia products. Multimedia is the bringing together of textual, graphical, video, and audio material.

Kiosk

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

Small, self-standing structure such as a newsstand or ticket booth. Unattended, multimedia kiosks dispense public information.

MCI

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

(Media Control Interface) High-level programming interface from IBM/Microsoft for controlling multimedia devices. It includes text commands such as open, play, and close for languages such as Visual Basic, as well as functions for languages such as C. See RIFF and AVI.

Multimedia

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

Multimedia is the combination of multiple forms of media in the communication of information. Multimedia enables people to communicate using integrated media: audio, video, text, graphics, fax, and telephony. The benefit is more powerful communication. The combination of several media often provides richer, more effective communication of information or ideas than a single media such as traditional text-based communication can accomplish. Multimedia communication formats vary, but they usually include voice communications (vocoding, speech recognition, speaker verification, and text-to-speech), audio processing (music synthesis, CD-ROMs), data communications, image processing and telecommunications using LANs and WANs in ISDN and POTS networks. Multimedia technology will ultimately take the disparate technologies of the computer, the telephone, the fax machine, the CD player, and the video camera and combine them into one powerful communication center. Technologies that were once analog -- video, audio, telephony -- are now digital. The power of multimedia is the integration of these digital technologies.

Multimedia PC

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

The Multimedia PC Council now defines a multimedia PC as a PC having a minimum of two megabytes of memory, a 30-megabyte hard drive, a CD-ROM drive, digital sound support, and Microsoft's Multimedia Extensions for Windows. See MULTIMEDIA.

Multimedia Capabilities

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

The ability to run simultaneous voice, image, data and video applications on a computer. A technology that requires enormous bandwidth and processing power. See MULTIMEDIA.

Multimedia Extensions

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

Windows routines that support audio recording and playback, animation playback, joysticks, MIDI, the MCI interface for CD-ROM, videodiscs, videotapes, etc., and the RIFF file format. See MPC.

Multi-Way Communication

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

A multimedia definition. Multi-way communication goes between two people, or between groups of people in all directions. Multi-way communication can be in real time or in store-and-forward mode. Examples of multi-way communication include videoconferencing, where one individual is giving a presentation to a group of people who listen and ask questions from their workstations; and group conferencing, where several people collaborate, supported by audio, video, and graphics on their workstation screens.

Piece

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

Productivity, Information, Education, Creativity, Entertainment. Microsoft's trick for remembering the big five multimedia computing applications.

Playback

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

A multimedia term. Playback is the process of viewing multimedia materials created by an author. Playback can include a range of activities, from viewing a single video clip to participating in a series of interactive multimedia training modules. Some playback applications (for example, many training and presentation applications) are sold separately from their authoring applications. However, many developers are selling authoring and playback capabilities in a single product.

QuickTime

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

Multimedia extensions to Macintosh's System 7 that add sound and video capabilities.

RIFF

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

(Resource Interchange File Format) Multimedia data format jointly introduced by IBM and Microsoft. (See MCI.)

Runtime

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

A runtime environment is the software that plays back multimedia materials. The runtime material is created by the author. Examples of runtime applications are presentations and training, where the material cannot be edited but only viewed. The runtime software could be a slide-show viewer, a software-only video playback application, or a hypermedia runtime document.

Shared Screens

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

A multimedia concept. Shared-screen applications enable two or more workstations to display the same screen simultaneously. For example, two users sharing a screen can work on the same spreadsheet. Changes made by one user can be seen by the other as they are made. Shared screens can be implemented in two ways: The first method enables people to view each other's screen while one person makes changes, and the second enables people to run the same application on both screens so that both users can make changes simultaneously.

Shared Whiteboards

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

A multimedia concept. Shared whiteboards enable you to "mark up" a screen using a mouse or stylus input device and have the results show on other screens, often communicating over long-distance telephone lines. The concept is similar to a traditional whiteboard mark-up process where everyone has a different color marking pen to circle, write, or cross out items. The background board can be a window from the workstation, such as a spreadsheet, image, or blank canvas, or it can be the entire workstation screen. The shared whiteboard can be used for either real-time or store-and-forward collaboration. In the store-and-forward scenario, the mark-ups can be implemented in a time-delayed fashion so that everyone can follow the entire step-by-step process.

Software-Only Video Playback

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

A multimedia term. Video software playback displays a stream of video without any specialized chips or boards. The playback is done through a software application. The video is usually compressed to minimize the storage space required.

Synchronization

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

A multimedia term. Synchronization is very precise real-time processing, down to the millisecond. Some forms of multimedia, such as audio and video, are time-critical. Time delays that might not be noticeable in text or graphics delivery can be unacceptable for audio and video. Workstations and networks must be capable of transmitting this kind of data in a synchronized manner. When audio and video are combined, they must be time-stamped so that they can both play back at the same time.

Telephony

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

Here's one definition: The science of converting or transmitting voice or other signals over a distance, and the reconvertng them to an audible sound at the far end. Here's another: Converting voices and other sounds into electrical impulses for transmission by wire or other means over distances greater than what you can hear by shouting.

A third definition comes from a white paper on multimedia from Sun Microsystems: Telephony refers to the integration of the telephone into the workstation. For instance, making or forwarding a call will be as easy as pointing to an address-book entry. Caller identification (if available from the telephone company) could be used to automatically start an application or bring up a database file. Voice mail and incoming faxes can be integrated with E-mail. Users can have all the features of today's telephones accessible through their workstations, plus the added benefits provided by integrating the telephone with other desktop functions.

Titles

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

In the language of multimedia, when an author sells what he or she has created, it is called a title. The encyclopedias, dictionaries, musical works, and games available on CD are all "titles." Someone authors the material, and sells it to users who can play it back but not change the content.

Ultimedia

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Newton, Harry.

IBM's word for the ultimate in multimedia -- combining sound, motion video, photographic imagery, graphics, text, and touch into a unified, natural interface representing, in IBM's words, the ultimate in multimedia solutions. Coined in the spring of 1992.

VESA

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

(Video Electronics Standards Association.) Organization of major PC graphics vendors devoted to improving graphics standards. It is involved with video-controller, monitor, and multimedia standards, including VGA, Super VGA, and XGA. (See PC display modes.) Address: 2150 N. 1st St., Suite 360, San Jose, CA 95131, (408) 435-0333.

Video for Windows

From the Computer Select Glossary, authors Harry Newton and Alan Freeman

Author: Freedman, Alan.

Software from Microsoft that supplements Windows 3.1 multimedia. It supports the AVI format and lets you capture, edit, and play full-motion video. It includes Media Player 2.0.

Find Out Where to Get Help

From ZiffNet

What can you do when computer trouble rears its ugly head? Or if you simply have a question? Flip to *The Tech Support Black Book*, that's what. We've compiled a list of tech support contacts at nearly 100 of the largest U.S. computer hardware and software companies to help you speed you directly to the right sources.

All numbers, addresses and hours of support were correct as of January, 1994. However, remember this information is subject to change without notice. Fax numbers are main fax numbers unless indicated as tech support faxes. Faxes sent to these main fax numbers and marked as technical support issues will be routed to the correct department. In some instances, a fax or direct-dial number will only be given out once a support technician has been assigned to your problem.

For the largest companies, all product-specific support numbers have been listed. However, for all other companies, unless otherwise indicated, only a main technical support number, fax number or BBS number is listed. If the particular company does have more than one support number for either hardware or software, the number we have listed here will be your best source for those secondary listings.

A to B

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San Jose, CA 95134

Main: 408-432-6200; 800-733-2237

Tech support: 800-637-7000

Support hours: 24 hrs/day; 7 days/week

Fax: 408-432-6221

CompuServe: GO PCVENF

BBS: 800-637-7000

ADAPTEC, INC.

691 S. Milpitas Blvd.

Milpitas, CA 95035

Main: 800-959-7274; 408-945-8600

Tech support: 408-945-2550

Support hours: 6am-5pm M-Th; 6am-3pm F (PST) Fax: 408-262-2533

FaxBack Service: 408-957-7150

BBS: 408-945-7727

ADOBE SYSTEMS, INC.

PO Box 7900, 1585 Charleston Rd.

Mountain View, CA 94039-7900

Main: 800-833-6687; 415-961-4400

Tech support: 408-986-6530

Support hours: 6am-6pm M-F (PST)

Fax: 415-961-3769

CompuServe: GO ADOBE

ADVANCED LOGIC RESEARCH, INC. (ALR)

9401 Jeronimo Rd.

Irvine, CA 92718

Main: 714-581-6770

Tech support: 714-458-0863

Support hours: 6am-6pm M-F; 7am-1pm S (PST) Tech fax: 714-458-0532

BBS: 714-458-6834

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411 First Ave., S.

Seattle, WA 98104-2871

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Support hours: 7am-5pm M-F (PST) CompuServe: GO ALDUSFORUM

APPLE COMPUTER, INC.

20525 Mariani Ave.

Cupertino, CA 95014

Main: 408-996-1010

Tech support: 800-767-2775

Support hours: 6am-6pm M-F (PST)

Tech fax: 408-974-9974

CompuServe: GO APPLE

AST RESEARCH INC.

16215 Alton Pkwy., PO Box 57005

Irvine, CA 92619-7005

Main: 800-876-4AST (4278); 714-727-4141 Tech support: 800-727-1278

Support hours: 6am-4:45pm M-F (PST)

Tech fax: 714-727-8579

CompuServe: GO NVENA

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Thornhill, ON, CD L3T 7N6

Main: 905-882-2600

Tech support: 905-882-2626

Support hours: 9am-7pm M-F (EST)

Tech fax: 905-882-0546

CompuServe: GO ATITECH (Graphics A Forum) BBS: 905-764-9404

BANYAN SYSTEMS, INC.

120 Flanders Rd.

Westboro, MA 01581-1033

Main: 508-898-1000

Tech support: 508-366-6089

Support hours: 8am-8pm M-F (EST)

Tech fax: 508-898-9611

CompuServe: GO BANYAN

BBS: 508-836-1834

BOCA RESEARCH, INC.

6413 Congress Ave.

Boca Raton, FL 33487-2841

Main: 407-997-6227

Tech support: 407-241-8088

Support hours: 8am-7pm M-F (EST)

Tech fax: 407-997-0918

CompuServe: GO BOCA (Modem vendor forum) BBS: 407-241-1601

BORLAND INTERNATIONAL, INC.

PO Box 660001, 100 Borland Way

Scotts Valley, CA 95067-0001

Main: 408-431-1000

Tech support: 800-523-7070; 408-841-8180 C, C++: 408-461-9133

Pascal: 408-461-9177

Dbase: 408-461-9060

Paradox for DOS: 408-461-9155 Paradox for Windows: 408-461-9166 Quattro Pro for DOS: 408-461-9122 Quattro Pro for Windows: 408-461-9188 Support hours: 6am-5pm M-F (PST) CompuServe: GO BORLAND

BBS: 408-431-5096

FaxBack: 800-822-4269

BROTHER INTERNATIONAL CORP.

Office Systems Division

200 Cottontail Lane

Somerset, NJ 08875-6714

Main: 908-356-8880

Tech support: 901-373-6256

Support hours: 9am-4:30pm M-F (CST) Tech fax: 800-947-1445

BBS: Call main # for listing

Printers

15 Music

Irvine, CA 92718

Tech Support: 800-276-7746 (outside CA) 714-859-9700 (in CA)

Support hours: 6am-4pm M-F (PST)

BBS: 714-859-2610

C to D

CABLETRON SYSTEMS, INC.

CANON COMPUTER SYSTEMS, INC.

CENTRAL POINT SOFTWARE, INC.

CITIZEN AMERICA CORP.

CLARIS CORP.

CMS RESEARCH, INC.

COMPAQ COMPUTER CORP.

COMPUTER ASSOCIATES INTERNATIONAL, INC.

CTX INTERNATIONAL, INC.

DATA GENERAL CORP.

DIGITAL EQUIPMENT CORP. (DEC)

DELL COMPUTER CORPORATION

CABLETRON SYSTEMS, INC.

35 Industrial Way, PO Box 5005 Rochester, NH 03867-0505

Main: 603-332-9400; 800-332-9401

Tech support: 603-332-5601

Support hours: 8am-8pm M-F (EST)

Tech fax: 603-337-3075

BBS: 603-335-4751

CANON COMPUTER SYSTEMS, INC.

(SUBSIDIARY OF CANON, INC.)

2995 Redhill Ave.

Costa Mesa, CA 92628-5048

Main: 714-438-3000; 800-848-4123

Tech support: 800-445-2780

Support hours: 24 hrs/day, 7 days/wk

Fax: 714-438-3099

CompuServe: GO CANON

BBS: 714-438-3325

CENTRAL POINT SOFTWARE, INC.

(See also XTree)

15220 N.W. Greenbrier Pkwy., Ste. 150

Beaverton, OR 97006

Main: 503-690-8088

Tech support: 800-846-5756; 503-690-8080 PCTools: 503-690-8080

PCTools for Windows: 503-645-6111

Macintosh products: 503-629-9440

Stand Alone Anti-Virus: 503-531-8555

Support hours: 6am-5pm M, T, Th, F; 6am-4pm W (PST) Tech fax: 503-690-7133

CompuServe: GO CENTRAL

BBS: 503-690-6650 (2400bps); 503-690-4777 (9600bps)

FaxBack: 503-690-2660

CITIZEN AMERICA CORP.

(SUBSIDIARY OF CITIZEN WATCH CO., LTD.)

PO Box 4003, 2450 Broadway, Ste. 600

Santa Monica, CA 90411-4003

Main: 800-477-4683; 310-453-0614

Tech support: 310-453-0614, ext. 464

Support hours: 8am-5pm M-F (PST)

Fax: 310-453-2814

BBS: 310-453-7564

CLARIS CORP.

(SUBSIDIARY OF APPLE COMPUTER, INC.)

PO Box 58199, 5201 Patrick Henry Dr.

Santa Clara, CA 95052-8168

Main: 800-544-8554; 408-987-7000

Tech support: 408-727-9054 (MAC) 408-727-9004 (WINDOWS)

Support hours: 6am-6pm M-Th; 6am-2pm F (PST) Tech fax: 408-987-7447

CompuServe: GO CLARIS

BBS: 408-987-7421

CMS RESEARCH, INC.

627 Bay Shore Dr.

Oshkosh, WI 54901

Main: 414-235-3356

Tech support: 414-235-3356

Support hours: 8am-4:30pm M-F (CST)

Fax: 414-235-3816

COMPAQ COMPUTER CORP.

P.O. Box 692000

Houston, TX 77269

Main: 713-370-0670; 800-345-1518

Tech support: 800-345-1518

Support hours: 24 hours/day; 7 days/week Tech fax: 713-378-1442

CompuServe: GO COMPAQ

BBS: 713-378-1418

COMPUTER ASSOCIATES INTERNATIONAL, INC.

One Computer Associates Plaza

Islandia, NY 11788-7000

Main: 800-CALL-CAI (225-5224); 516-342-5224 Tech support: 800-964-1234

Support hours: 8am-8pm M-F (EST)

Fax: 516-342-5329

CTX INTERNATIONAL, INC.

20530 Earlgate St.

Walnut, CA 91789

Main: 800-DIAL-CTX (342-5289); 909-595-6146 Tech support: 800-288-3612; 201-797-7601 Support
hours: 9am-5pm M-F (PST)

Tech fax: 201-797-7603

DATA GENERAL CORP.

4400 Computer Dr.

Westboro, MA 01580

Main: 508-366-8911; 800-328-2436

Tech support: 800-344-3577

Support hours: 24 hours/day; 7 days/week

DIGITAL EQUIPMENT CORP. (DEC)

146 Main St.

Maynard, MA 01754-2571

Main: 508-493-5111; 800-332-4636

Tech support: 800-354-9000

Support hours: 24 hours/day; 7 days/week Fax: 508-841-6100

CompuServe: GO DEC

BBS: 508-496-8800

DELL COMPUTER CORPORATION

9505 Arboretum Blvd.

Austin, TX 78759-7299

Main: 512-338-4400

Tech support: 800-624-9896

Support hours: 24 hours/day; 7 days/week CompuServe: GO NVENA

BBS: 512-728-8528

FaxBack: 800-950-1329

E to H

EPSON AMERICA, INC.

EVEREX SYSTEMS, INC.

FIFTH GENERATION SYSTEMS, INC.

FUJITSU COMPUTER PRODUCTS OF AMERICA, INC.

GATEWAY 2000, INC.

HEWLETT-PACKARD CO.

HITACHI AMERICA, LTD.

HYUNDAI ELECTRONICS AMERICA

EPSON AMERICA, INC.

(SUBSIDIARY OF SEIKO EPSON CORP.)

20770 Madrona Ave., PO Box 2842

Torrance, CA 90509-2842

Main: 310-782-0770; 800-289-3776

Tech support: 800-922-8911 [Printers]

Support hours: 6am-6pm M-F (PST)

CompuServe: GO EPSON

BBS: 310-782-4531

EVEREX SYSTEMS, INC.

901 Page Ave.

Fremont, CA 94538

Main: 800-821-0806; 510-498-1111

Tech support: 510-498-4411

Support hours: 6am-5pm M-F (PST)

Tech fax: 510-683-3398

BBS: 510-226-9694

FIFTH GENERATION SYSTEMS, INC.

(SUBSIDIARY OF SYMANTEC CORP.)

10049 N. Reiger Rd.

Baton Rouge, LA 70809-4562

Main: 504-291-7221; 800-677-1848

Tech support: 800-766-7283; 504-291-7283 Support hours: 7am-7pm M-F (CST)

Tech fax: 504-295-3268

CompuServe: GO FIFTH

BBS: 504-295-3344 (2400bps) 504-295-3261 (9600bps)

FUJITSU COMPUTER PRODUCTS OF AMERICA, INC.

(SUBSIDIARY OF FUJITSU AMERICA, INC.)

2904 Orchard Pkwy.

San Jose, CA 95134-2009

Main: 408-432-6333

Tech support: 800-826-6112

Support hours: 8am-5pm M-F (PST)

Tech fax: 408-894-3743

CompuServe: GO PACVEN; PCVENJ

BBS: 408-944-9899

GATEWAY 2000, INC.

610 Gateway Dr., PO Box 2000

North Sioux City, SD 57049-2000

Main: 605-232-2000; 800-846-2000

Tech support: 800-846-2301

Support hours: 6am-midnight M-F; 9am-2pm S (CST) Tech fax: 605-357-1056

CompuServe: GO GATEWAY

BBS: 605-232-2109 (2400bps); 605-232-2224 (9600bps)

HEWLETT-PACKARD CO.

3000 Hanover St.

Palo Alto, CA 94304

Main: 415-857-1501; 800-387-3867

Tech support: 208-323-2551 (printers) 800-858-8867 (PCs)

Support hours: 7am-6pm M,T,Th,F; 7am-4pm W (MST) CompuServe: GO HP

HITACHI AMERICA, LTD.

(COMPUTER DIVISION)

2000 Sierra Point Pkwy., Hitachi Plaza Brisbane, CA 94005

Main: 415-589-8300; 800-HITACHI (800-448-2244) Tech support: 800-448-2244

Support hours: 7am-6pm M-F (PST)

BBS: Call for product-specific number

HYUNDAI ELECTRONICS AMERICA

(SUBSIDIARY OF HYUNDAI ELECTRONICS INDUSTRIES CO., LTD.)

166 Baypointe Pkwy.

San Jose, CA 95134

Main: 800-727-6972; 408-473-9200

Tech support: 800-289-4986

Support hours: 7am-5pm M-F (PST)

Fax: 800-964-4762

BBS: 408-473-9899

I to Ma

IBM (INTERNATIONAL BUSINESS MACHINES)

INTEL CORP.

INTUIT

KODAK LABORATORY RESEARCH PRODUCTS

LEADING EDGE PRODUCTS, INC.

LOGITECH, INC.

LOTUS DEVELOPMENT CORP.

MAG INNOVISION

IBM (INTERNATIONAL BUSINESS MACHINES)

Old Orchard Rd.

Armonk, NY 10504

Main: 914-765-1900

Tech support: 800-426-3333

Support hours: 6am-6pm M-F (MST); 24 hours/day; 7 days/week for BBS CompuServe: GO IBMNET

BBS: 919-517-0001

Fax Info System: 800-426-3395

INTEL CORP.

PO Box 58119, 2200 Mission College Blvd.

Santa Clara, CA 95052-8119

Main: 408-765-8080

Tech support: 800-628-8686 [Components and microprocessors]

503-629-7000 [PC Enhancements Division]

Support hours: 7am-5pm M-F (PST)

CompuServe: GO INTEL

BBS: [Components] 800-897-2536 view only 916-356-3600 download [Branded products] 503-645-6275

INTUIT

P.O. Box 3014

Menlo Park, CA 94026

Main: 415-322-0573; 415-852-9696

Tech support: 800-624-8742

Support hours: 7am-5pm M-F (PST) CompuServe: GO INTUIT

KODAK LABORATORY RESEARCH PRODUCTS

(DIVISION OF EASTMAN KODAK CO.)

25 Science Park, PO Box 9558

New Haven, CT 06511

Main: 800-243-2555; 203-786-5600

Tech support: 800-243-2555

Support hours: 8:30am-5pm M-F (EST)

Fax: 203-624-3143

CompuServe: GO KODAK

LEADING EDGE PRODUCTS, INC.

(SUBSIDIARY OF DAEWOO TELECOM, LTD. CO.)

117 Flanders Rd., P.O. Box 5020

Westborough, MA 01581-5020

Main: 800-874-3340; 508-836-4800

Tech support: 900-370-4800

Support hours: 9am-5:30pm M-F (PST)

Fax: 508-836-4504

BBS: 508-836-3967

LOGITECH, INC.

6505 Kaiser Drive

Fremont, CA 94555

Main: 800-231-7717; 510-795-8500

Tech Support: 510-795-8100

Support hours: 8am-5pm M-Th; 9am-4pm F, S, S (PST) Tech fax: 510-505-0978

CompuServe: GO LOGITECH

BBS: 510-795-0408

LOTUS DEVELOPMENT CORP.

55 Cambridge Pkwy.

Cambridge, MA 02142-1295

Main: 617-577-8500; 800-343-5414

1st minute free/\$2 each additional minute: 900-454-9009 Automated support center: 800-346-3508

No Prompt ID #; call to renew contract: 800-553-4270

The following support services require a Prompt ID number:

Windows (with Prompt ID #): 800-386-8600

DOS (with Prompt ID #): 800-223-1662 Ami Pro 2.0 and 3.0: 800-386-8600

Ami Pro 3.1: 404-399-5505

cc:Mail: 415-966-4900

Notes: 800-437-6391

Support hours: 24 hours/day; 7 days/week Fax: 617-693-3512

CompuServe: GO LOTUS

MAG INNOVISION

2801 South Yale St.

Santa Ana, CA 92704

Main: 800-827-3998

Tech support: 714-751-2008??

Support hours: 8am-5pm M-F (PST)

MICROSOFT CORP.

One Microsoft Way

Redmond, WA 98052-6399

Main: 206-882-8080

FastTips: 800-936-3500

Fax: Call main number for product-specific fax tech support: STANDARD SUPPORT

Related Topics:

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Desktop Programs for Windows:

Access: 206-635-7050:

Excel for Windows and OS/2: 206-635-7070

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Money: 206-635-7131

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Desktop Programs for MS-DOS:

FoxPro Products for MS-DOS: 206-635-7191

Word for MS-DOS: 206-635-7210

Works for MS-DOS: 206-635-7150

Desktop Programs for the Macintosh:

Excel for the Macintosh: 206-635-7080

FoxPro Products for the Macintosh: 206-635-7192

Office for the Macintosh: 206-635-7055

Word for the Macintosh: 206-635-7200

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Personal Operating Systems and Hardware:

Windows: 206-635-7040: 206-637-7098

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MS-DOS 6 and 6.2 Upgrade: 206-646-5104

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Windows NT: 206-635-7018

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Desktop (\$2/minute, \$25/incident cap): 900-555-2000

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Development FastTips: 800-936-4300

Advanced Systems FastTips: 800-936-4400

Microsoft Download Service: 206-936-6735

CompuServe Information Service Sales: 800-848-8199

Support hours: 6am-6pm M-F (PST)

CompuServe: GO MICROSOFT

Mi to N

MITSUBISHI ELECTRONICS AMERICA, INC.

MOTOROLA, INC.

NANAO USA CORP.

NATIONAL SEMICONDUCTOR CORP.

NCR CORP.

NEC TECHNOLOGIES INC.

NORTHGATE COMPUTER SYSTEMS, INC.

NOVELL, INC.

MITSUBISHI ELECTRONICS AMERICA, INC.

(DISPLAY PRODUCTS DIVISION)

5665/5757 Plaza Dr., P.O. Box 6007

Cypress, CA 90630-0007

Main: 800-843-2515; 714-220-2500

Tech support: 800-344-6352

Support hours: 8am-11:50am; 12:30pm-4:30pm M-F (PST)

Tech fax: 714-236-6425

FaxBack: 714-236-6453

BBS: 714-236-6286

MOTOROLA, INC.

1303 E. Algonquin Rd.

Schaumburg, IL 60196

Main: 708-576-5000

Tech support: 800-521-6274 (chips)

Support hours: 7:30am-4pm (MST)

NANAO USA CORP.

23535 Telo Ave.

Torrance, CA 90505

Main: 310-325-5202

Tech Support: 310-325-5202, ext. 114

Support hours: 8:30am-5pm M-F (PST)

Fax: 310-530-1679

BBS: 310-325-4744

NATIONAL SEMICONDUCTOR CORP.

PO Box 58090, 2900 Semiconductor Dr.

Santa Clara, CA 95052-8090

Main: 408-721-5000

Tech support: 800-272-9959

Support hours: 7am-5pm M-F (PST)

Tech fax: 800-428-0065

NCR CORP.

1700 S. Patterson Blvd.

Dayton, OH 45479

Main: 513-445-5000

Tech support: 800-543-9935

Support hours: 24 hrs/day, 7 days/week

CompuServe: GO NCR

BBS: 800-624-5672 (EasyLink) 800-325-4112 (Direct dial)

NEC TECHNOLOGIES INC.

1414 Mass. Ave.

Boxborough, MA 01719

Main: 508-264-8000

Tech support: 800-388-8888

Support hours: 8:30am-8pm M-F (CST)

Fax: 508-635-4666

FaxBack: 800-366-0476

BBS: 508-635-4706

NORTHGATE COMPUTER SYSTEMS, INC.

PO Box 208

Chaska, MN 55318

Main: 800-548-1996; 612-361-5000

Tech support: 800-446-5037

Support hours: 24 hrs./day, 7 days/week Tech fax: 612-361-5219

CompuServe: GO PCVENA

BBS: 612-361-5201 (2400bps) 612-361-5217 (9600bps)

NOVELL, INC.

122 East 1700 South

Provo, UT 84606-6194

Main: 800-453-1267; 801-429-7000

Tech support: 800-638-9273 (800-Netware)

[This is a central tech support number for all Novell products.]

Support hours: 24 hrs/day, 7 days/week

Tech fax: 801-429-5200

CompuServe: GO NOVELL

BBS: 800-848-8199

O to Q

OKIDATA CORP.

OLIVETTI NORTH AMERICA

PACKARD BELL, INC.

PANASONIC COMMUNICATIONS & SYSTEMS CO.

PROTEON, INC.

PURE DATA, INC.

QMS, INC.

QUALITAS, INC.

QUARTERDECK OFFICE SYSTEMS

QUE SOFTWARE

OKIDATA CORP.

(DIVISION OF OKI AMERICA, INC.)

532 Fellowship Rd.

Mt. Laurel, NJ 08054

Main: 800-654-3282; 609-235-2600

Tech support: 609-273-0300

Support hours: 8am-6pm M-F (EST)

Tech fax: 609-273-2779

BBS: 800-283-5474

OLIVETTI NORTH AMERICA

(SUBSIDIARY OF OLIVETTI CO.)

Systems software/applications/computer systems:

22425 E. Appleway Ave.

Liberty Lake, WA 99019-9534

Main: 800-633-9909; 509-927-5600

Tech support: 800-525-3991

Support hours: 8:30am-5pm M-F (EST)

Tech fax: 509-927-5759

PACKARD BELL, INC.

9425 Canoga Ave.

Chatsworth, CA 91311

Main: 818-886-9998

Tech support: 800-733-4411; 818-886-2098

Support hours: 8am-5pm M-F (PST)

Fax: 818-773-9516

CompuServe: GO PACKARDBELL

PANASONIC COMMUNICATIONS & SYSTEMS CO.

(OFFICE AUTOMATION GROUP)

2 Panasonic Way

Secaucus, NJ 07094

Main: 800-742-8086; 201-392-4500

Tech support: 800-222-0584

Support hours: 9am-5pm M-F (EST)

PROTEON, INC.

9 Technology Dr.

Westborough, MA 01581-1799

Main: 508-898-2800

Tech support: 508-898-2800

Support hours: 8am-8pm M-F (EST)

Tech fax: 508-898-2118

BBS: 508-366-7827

PURE DATA, INC.

1740 S. I-35

Carrollton, TX 75006

Main: 800-661-8210; 214-242-2040

Tech support: 800-661-8210

Support hours: 8am-8pm M-F (CST)

Tech fax: 905-731-4137

CompuServe: GO PUREDATA

BBS: 416-492-5980

QMS, INC.

One Magnum Pass, PO Box 81250

Mobile, AL 36689-1250

Main: 205-633-4300

Tech support: 205-633-4500

Support hours: 8am-5pm M-F (CST)

Tech fax: 205-633-3716

BBS: 205-633-3632

QUALITAS, INC.

7101 Wisconsin Ave., Ste. 1386

Bethesda, MD 20814

Main: 301-907-6700

Tech support: 301-907-7400

Support hours: 10am-5pm M-F (EST)

Tech fax: 301-718-6061

FaxBack: 301-718-6061

CompuServe: GO PCVENA

QUARTERDECK OFFICE SYSTEMS

150 Pico Blvd.

Santa Monica, CA 90405-1018

Main: 800-354-3222; 310-392-9851

Tech support: 310-392-9701

Support hours: 7:30am-4:30pm M-Th; 10am-4:30pm F (PST)

Tech fax: 310-314-3217

CompuServe: GO QUARTERDECK

BBS: 310-314-3227

QUE SOFTWARE

(DIVISION OF PRENTICE HALL COMPUTER PUBLISHING)

11711 N. College Ave., Ste. 140

Carmel, IN 46032-5634

Main: 800-992-0244; 317-581-3500

Tech support: 317-581-3833

Support hours: 8am-5pm M-F (EST)

Fax: 317-581-4773

CompuServe: GO PHCP

BBS: 317-581-4771

R to T

RADIUS

SAMTRON DISPLAYS, INC.

SEIKO INSTRUMENTS U.S.A., INC.

SEIKOSHA AMERICA, INC.

SHIVA CORP.

SIEMENS NIXDORF INFORMATION SYSTEMS, INC. Applications:

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TEXAS INSTRUMENTS, INC.

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TOSHIBA AMERICA CONSUMER PRODUCTS, INC.

TOSHIBA AMERICA INFORMATION SYSTEMS, INC.

RADIUS

1710 Fortune Drive

San Jose, CA 95131

Main: 408-434-1010

Tech support: 408-434-1012

Support hours: 6am-6pm M-F (PST)

Tech fax: 408-954-1015

CompuServe: GO RADIUS

BBS: 408-954-1689

SAMTRON DISPLAYS, INC.

(DIVISION OF SAMSUNG DISPLAY DEVICES CO., LTD.)

14251 E. Firestone Blvd., Ste. 101

La Mirada, CA 90638

Main: 310-802-8425

Tech support: 714-522-1282 ext. 101

Support hours: 8am-5pm M-F (PST)

Tech fax: 714-522-6477

SEIKO INSTRUMENTS U.S.A., INC.

Printers, monitors:

1130 Ringwood Court

San Jose, CA 95131

Main: 408-922-5900

Tech support: 800-553-5312

Support hours: 7am-5pm M-F (PST)

Fax: 408-922-5840

BBS: 408-428-9810

SEIKOSHA AMERICA, INC.

10 Industrial Ave.

Mahwah, NJ 07430

Main: 800-338-2609; 201-327-7227

Tech support: 800-825-5349

Support hours: 6am-midnight M-F (PST)

SHIVA CORP.

63 Third Ave., Northwest Park

Burlington, MA 01803

Main: 617-270-8300

Tech support: 617-270-8400

Support hours: 9am-6pm M-F (EST)

Tech fax: 617-270-8599

BBS: 617-273-0023

SIEMENS NIXDORF INFORMATION SYSTEMS, INC. Applications:

200 Wheeler Rd.

Burlington, MA 01803

Main: 800-225-1484; 617-273-0480

Tech support: 617-273-0480

Support hours: 8am-5pm M-F (EST)

Tech fax: 617-221-0215

Corporate headquarters: HQ: 212-258-4000

SIEMENS NIXDORF PRINTING SYSTEMS, LP Printers:

5500 Broken Sound Blvd.

Boca Raton, FL 33487-3599

Main: 800-523-5444; 407-997-3100

Tech support: 407-997-3100

Support hours: 8am-5pm M-F (EST)

Tech fax: 407-997-2924

SOFTWARE PUBLISHING CORP. (SPC)

3165 Kifer Rd., PO Box 54983

Santa Clara, CA 95056-0983

Main: 408-986-8000

Tech support: 408-988-4005; 800-234-2500

Support hours: 7am-4pm M-F (PST)

Tech fax: 408-980-1518

CompuServe: GO SPC

BBS: 408-986-0342 (2400bps) 408-986-1272 (9600bps)

SONY CORP. OF AMERICA

(COMPUTER PERIPHERAL PRODUCTS CO.)

3300 Zanker Rd.

San Jose, CA 95134

Main: 800-352-7669; 408-432-0190

Tech support: 408-894-0555 (end users)

Support hours: 8am-5pm M-F (PST)

Tech fax: 408-955-5169

BBS: 408-955-5107

SPINNAKER SOFTWARE CORP.

(See also WordStar International, Inc.)

201 Broadway, 6th Fl.

Cambridge, MA 02139-1901

Main: 800-323-8088; 617-494-1200

Tech support: 404-428-0008

Support hours: 10am-5pm M-F (EST)

Tech fax: 617-494-0119

CompuServe: GO SPINNAKER

STAC ELECTRONICS

5993 Avenida Encinas

Carlsbad, CA 92008

Main: 619-431-7474

Tech support: 619-929-3900

Support hours: 8am-5pm M-F (PST)

CompuServe: GO STACKER

BBS: 619-431-5956

FaxBack: 619-431-8585

STANDARD MICROSYSTEMS CORP.

(SYSTEM PRODUCTS DIVISION)

350 Kennedy Dr.

Hauppauge, NY 11788

Main: 516-435-6000; 800-SMC-4-YOU (762-4968)

Tech support: 800-992-4762

Support hours: 8:30am-8pm M-F (EST)

Tech fax: 516-434-9314

CompuServe: GO SMC

BBS: 516-434-3162 (East Coast) 714-707-2481 (West Coast)

STAR MICRONICS AMERICA, INC.

(SUBSIDIARY OF STAR MICRONICS CO., LTD.)

420 Lexington Ave., Ste. 2702

New York, NY 10170

Main: 212-986-6770

Tech support: 908-572-3300

Support hours: 10am-6pm M; 9am-6pm T-Th (EST)

Tech fax: 908-572-5995

FaxBack: 908-572-4004

BBS: 908-572-5010

SYMANTEC CORP.

10201 Torre Ave.

Cupertino, CA 95014-2132

Main: 800-441-7234; 408-253-9600

Tech support: 503-465-8640

Support hours: 7am-5pm M-F (PST)

Fax: 503-334-7473

FaxBack: 800-554-4403

CompuServe: GO SYMANTEC

BBS: 503-484-6699 (2400bps); 503-484-6669 (9600bps)

SYNOPTICS COMMUNICATIONS, INC.

PO Box 58185,

4401 Great America Pkwy.

Santa Clara, CA 95052-8185

Main: 408-988-2400

Tech support: 800-473-4911

Support hours: 7am-5:30pm M-F (PST)

Tech fax: 408-764-1188

CompuServe: GO NVENA

TANDY CORP./RADIO SHACK

700 One Tandy Center

Ft. Worth, TX 76102

Main: 817-390-3011

Tech support: 817-390-3861

Support hours: 9am-7pm M-F (CST)

Tech fax: 817-870-0412

CompuServe: GO TANDY

TEXAS INSTRUMENTS, INC.

Hardware:

PO Box 655474

Dallas, TX 75265

Main: 800-527-3500; 214-995-2011

Tech support: 800-336-5236

Support hours: 7:30am-5:30pm M-F (CST)

CompuServe: GO TIFORUM

TEXAS INSTRUMENTS, INC.

(INFORMATION TECHNOLOGY GROUP)

Software applications:

6550 Chase Oaks Blvd., M/S 8411

Plano, TX 75086

Main: 800-336-5236; 214-995-2011

Tech Support: 800-336-5236

Support hours: 7:30am-5:30pm M-F (CST)

CompuServe: GO TIFORUM

3COM CORP.

PO Box 58145, 5400 Bayfront Plaza

Santa Clara, CA 95052-8145

Main: 408-764-5000

Tech support: 800-876-3266

Support hours: 8am-6pm M-F (PST)

CompuServe: Go ASKFORUM

BBS: 408-980-8204

TOSHIBA AMERICA CONSUMER PRODUCTS, INC.

17" and 21" monitors only:

1010 Johnson Dr.

Buffalo Grove, IL 60089-6900

Main: 800-253-5429; 708-541-9400

Tech support: 708-541-9400, ext. 232 Support hours: 9am-12pm; 1pm-5pm M-F (CST) CompuServe: GO
TOSHIBA

TOSHIBA AMERICA INFORMATION SYSTEMS, INC.

(TAIS)

Notebooks:

9740 Irvine Blvd., PO Box 19724

Irvine, CA 92718

Main: 800-334-3445; 714-583-3000

Tech support: 714-587-9476

Support hours: 8am-4pm M-F (PST)

Tech fax: 714-583-3827

V to Z

VIEWSONIC

WORDPERFECT CORP.

WORDSTAR INTERNATIONAL, INC.

XEROX COMPUTER SERVICES

XEROX CORP.

XIRCOM, INC.

XTREE CO.

ZENITH DATA SYSTEMS

ZEOS INTERNATIONAL LTD.

VIEWSONIC

20480 Business Pkway.

Walnut, CA 91789

Main: 909-869-7976

Tech support: 909-869-7976

Support hours: 8am-5pm M-F (PST)

Fax: 909-869-7958

BBS: 909-468-1241

WORDPERFECT CORP.

1555 N. Technology Way

Orem, UT 84057-2399

Main: 800-451-5151; 801-225-5000

Tech fax: 801-222-4377

Tech support: 800-451-5151 (for product-specific numbers)

WordPerfect for Windows 6.0

Features:	800-228-9907
Graphics and Tables:	800-228-8720
Macro/merge/labels:	800-228-2021
Laser printers/Postscript/Bitstream:	800-228-2803
Dot matrix printers:	800-228-6646
Installation:	800-228-7610
Networks:	800-228-8807

WordPerfect for DOS 6.0

Features:	800-228-9038
Graphics and Tables:	800-228-9006
Macro/merge/labels:	800-228-9013
Laser printers/Postscript/Bitstream:	800-228-9027
Dot matrix printers:	800-228-9032
Installation:	800-228-9012
Networks:	800-228-9019

WordPerfect for Windows 5.2

Features:	800-228-1029
Graphics and Tables:	800-228-6013
Macro/merge/labels:	800-228-1032
Laser printers/Postscript/Bitstream:	800-228-1023
Dot matrix printers:	800-228-1017
Installation:	800-228-6076
Networks:	800-228-6066

WordPerfect for DOS 5.2/5.0/4/2

Features:	800-228-5096
Graphics and Tables:	800-228-3383
Macro/merge/labels:	800-228-5129
Laser printers/Postscript/Bitstream:	800-228-5170
Dot matrix printers:	800-228-5160
Installation:	800-228-9605
Networks:	800-228-3389
DataPerfect:	800-321-3249
Presentations for DOS/Windows:	800-541-5098

Office for DOS/Windows: 800-321-3253

Informs for DOS/Windows: 801-228-9916

Works:	800-321-3512
WordPerfect for Macintosh:	800-228-2875
DOS/Windows:	801-228-9918
Macintosh:	801-228-9917
Unix:	801-226-5333

Support hours: 7am-6pm M-F (MST) After-hours support: 801-228-9908

[6pm-7am M-Th; 6pm-12pm F; 8am-4pm F (MST)]

CompuServe: GO WORDPERFECT

BBS: 801-225-4414 (2400bps); 801-225-4414 (9600bps)

WORDSTAR INTERNATIONAL, INC.

PO Box 6113, 201 Alameda del Prado

Novato, CA 94949

Main: 415-382-8000

Tech support: 404-428-0008

Support hours: 9am-6pm M-F (EST)

Tech fax: 404-427-1150

FaxBack: 404-514-6333

CompuServe: GO WORDSTAR

BBS: 404-514-6332

XEROX COMPUTER SERVICES

Software Applications:

5310 Beethoven St.

Los Angeles, CA 90066

Main: 310-306-4000

Tech support: 310-306-4000

Support hours: 8am-5pm M-F (PST)

BBS: 310-306-1513

XEROX CORP.

(U.S. CUSTOMER OPERATIONS DIVISION)

Modems, Printers:

PO Box 24

Rochester, NY 14601

Main: 716-423-5078

Tech support: 800-832-6979

Support hours: 8am-7:30pm M-Th; 8am-6pm F (EST)

XIRCOM, INC.

26025 Mureau Rd.

Calabasas, CA 91302

Main: 818-878-7600

Tech support: 800-874-4428

Support hours: 6am-4:30pm M-F (PST)

Tech fax: 818-878-7175

CompuServe: GO PCVENH

BBS: 818-878-7618

XTREE CO.

(DIVISION OF CENTRAL POINT SOFTWARE)

15220 N.W. Greenbrier Pkwy., Ste. 150 Beaverton, OR 97006

Main: 800-964-6896; 503-690-8088

Tech support: 503-690-8080

Support hours: 6am-5pm M-F (PST)

Fax: 503-690-7133

CompuServe: GO CENTRAL

BBS: 503-690-6650 (2400bps); 503-690-4777 (9600bps)

ZENITH DATA SYSTEMS

2150 E. Lake Cook Rd.

Buffalo Grove, IL 60089

Main: 708-808-5000

Tech support: 800-227-3360

Support hours: 7am-11pm M-F (CST)

CompuServe: GO ZENITH

BBS: 708-808-4942

ZEOS INTERNATIONAL LTD.

1301 Industrial Blvd.

Minneapolis, MN 55413-9852

Main: 800-423-5891; 612-623-9614

Tech support: 800-228-5390

Support hours: 24 hrs/day, 7 days/wk

Tech fax: 612-633-4607

CompuServe: GO PCVENE

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