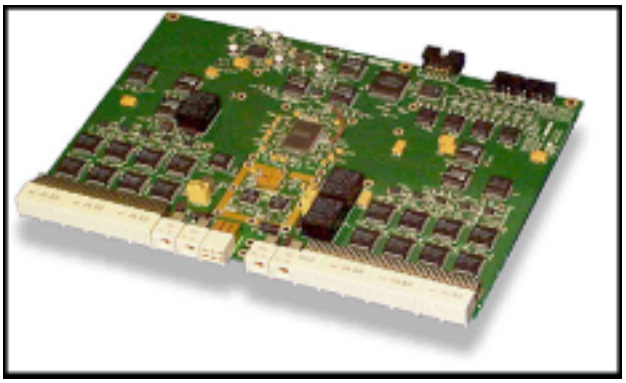
# Hardware Concepts

16-BIT VIDEO CARD. A video card that can display up to 65,536 colors.

24-BIT (or True Color) VIDEO CARD.. A video card that can display 16.7 million colors.

8-BIT VIDEO CARD. A video card that can display up to 256 colors. The lowest-end sound card.



ADC (Analog -to-Digital Converter). Recording feature of sound cards that converts the analog / sound waveforms to digital format, i.e. bits and bytes. This digital representation can then be stored, edited, processed and transferred between media. To playback sound files, the sound card uses a DAC (Digital-to-Analog Converter). The ADC samples the audio at very fast intervals ("sampling rate"), producing a stream of snapshots. When played back by the DAC at the same pace, the samples are perceived as sound.

AGP. The accelerated graphics port is a dedicated port directly linking graphics to memory. AGP usually runs at twice the speed of the PCI bus.

ANALOG. Continuous real time phenomena. In other words, waveforms, with valleys and ridges, referring to the natural form of sound / audio.

ANALOG-TO-DIGITAL (A / D) CONVERSION. The process of changing an analog signal into a digital value that represents the magnitude of the signal at the moment of conversion.

API (Application Programming Interface). Set of routines / functions that an application program uses to request and carry out lower-level services performed by the operating system. For Windows, for example, API's help manage icons, windows, menus and other GUI elements.

BANDWIDTH. The width of the band over which frequencies are transmitted. A band is a portion of the electromagnetic spectrum, defined by the lowest and highest frequencies in it. The bandwidth is the difference between the highest and lowest frequencies. The greater the bandwidth, the greater the carrying capacity. The Federal Communications Commission allocates portions of the band. For example, the band for VHF television broadcast is defined from 54 to 88 million cycles per second. And, of course, the band contains many "channels".

BIOS (Basic Input / Output System). A program, usually stored in ROM, which provides the fundamental services required for the operation of the computer. These services range from peripheral control to updating the time of day. We are not supposed to change the contents of BIOS during the regular operation of computers. Some viruses in the Windows

environment can filter into the computers' BIOS and make the machine unserviceable. These types of viruses can be easily spread through internet and e-mailing. In the picture at the left, the person lying on the ground is configuring the BIOS of several computers.

BUFFER. (1) A temporary storage device used to compensate for a difference in data rate and data flow between two devices (typically a computer and a printer); also called a spooler; (2) An amplifier to increase the drive capability, current or distance, of an analog or digital signal.

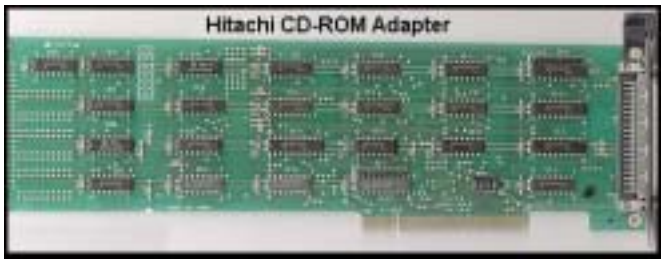
BUS. A data path shared by many devices with one or more conductors for transmitting signals, data, or power. In LAN technology, a bus is a type of linear network topology. The higher the bus speed the faster is your computer.

CACHE MEMORY. Fast memory used to improve the performance of a CPU. Instructions that will soon be executed are placed in cache memory shortly before they are needed. This process speeds up the operation of the CPU. Most present-day computers have 512 K cache memory, ones with 1 Mb operate faster than the latter ones and therefore are more expensive.

CD-i (Compact Disc Digital Interactive). A standard developed by Phillips / Sony for CDs containing a mix of sound, full-screen video and interaction.


CD-R (Compact Disk-Recordable). A multi-session CD-ROM recording format; requires a multi-session CD-ROM drive. Needed for backup / archive, catalogs and other large documents, and multimedia storage. Written for once and readable for many times. It is a cheap storage medium (About a dollar a piece in Turkey these days).

CD-ROM (compact-disc read-only-memory) is a technology in which audio, data, graphics, video and text are stored digitally on discs. The information on the disc cannot be changed. CD-ROM discs are a form of optical discs. 650 megabytes or 74 minutes of data can be stored on a CD-ROM disc.




CD-ROM hybrid. CD-ROM's with embedded Internet links. Although the Web can provide current information, i.e. timely updates and corrections, it lacks the bandwidth to deliver large multimedia files quickly. The "Internet-enabled" CD-ROM, or "cybrid," is being promoted as a software solution that will use the strengths of both technologies. The parts of a program that can slow down access time if downloaded from the Internet (multimedia, index searches) are kept on the CD-ROM for faster loading. The Internet side of the equation is used for providing, and for

adding new features without the need to send out a new CD-ROM disc. In the near future, look for hybrid DVD's.

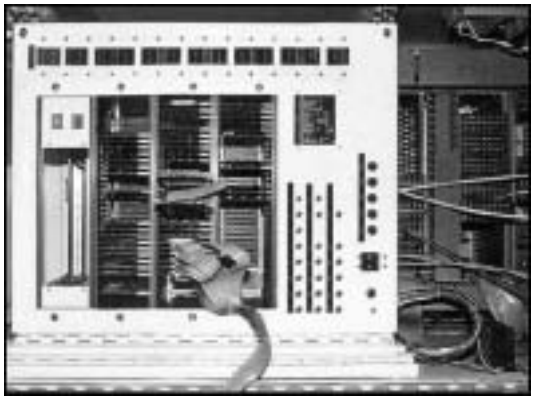
CD-ROM servers. Devices, like towers, changers and jukeboxes, that allow you to put CD-ROM's on networks: one CD, rather than multiple copies, serves many users. CD-ROM towers stack multiple drives, sometimes as many as 40, in a single box. Each drive has a read head for its CD, making access fairly fast. CD-ROM changers swap CD's in and out of the ONE drive. The jukebox, the changer's "big brother", can store up to 2,000 CD's and can be as big as a refrigerator. The swapping action can slow CD access, especially for changers.

CDROM-XA (Extended Architecture). The standard for pressing CD-ROM disks (See CD-R), which interleaves audio and digital signals for playback on the computer.

CD-RW (CD-ReWritable). An erasable CD-ROM. It can be used as an external hard drive. Backers of the new technology say that erasable CDs is a flexible new storage solution, holding 450 times more data than a typical floppy. Critics point out that CD-RWs can't be played on some of the currently installed CD-ROM drives. Hewlett-Packard's "MultiRead" technology enables all new CD-ROM drives to handle CD-RW discs. Meanwhile, the new DVD (digital versatile disc) drives are able to handle CD-RW discs.

CISC (Complex Instruction Set Chip). Motorola 68040 CISC chip executes about 1.3 instructions per cycle.

CLIENT. Any computer connected to a host computer, or the software used to connect to the host. For example, Netscape is the browser, i.e. the client program, that connects to Apple's Web host server (www.apple.com).



COPROCESSOR. Another computer processor unit that operates in conjunction with the standard CPU. Can be used to enhance execution speed. For example, the 8087 was designed to perform floating point arithmetic.

CPU (Central Processing Unit). The central part of a computer system that performs operations on data. In a personal computer the CPU is typically a single microprocessor integrated circuit.

CROSSOVER. In communications, a conductor which runs through the cable and connects to a different pin number at each end. When you connect two computers using ethernet and no hub you will need a crossover cable.

DIGITAL SIGNAL PROCESSOR. A separate processor, built into some sound cards, that offloads / relieves audio processing from the computer's CPU. DSPs are dedicated to processing real-time audio and video signals. For example, the DSP chip on a sound card lets you add echoes, reverb and other special effects.

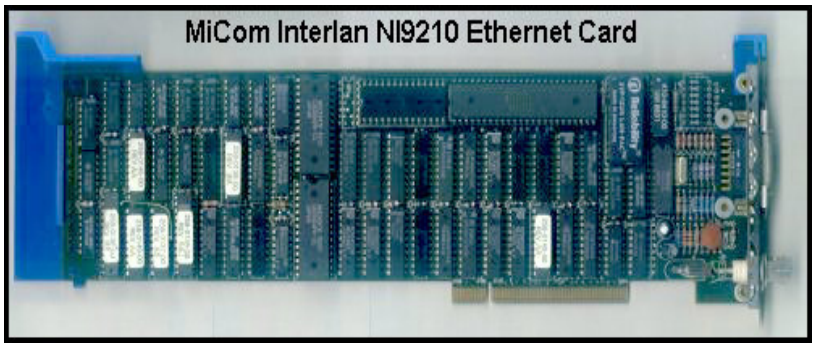
DIRECT MEMORY ACCESS (DMA). A method by which information can be transferred from the computer memory to a device on the bus without using the processor.

DOLBY AC-3. A surround-sound algorithm adopted by the computer, consumer, and entertainment industries for handling the audio portion of movies on digital media.

DRIVER (HARDWARE). An electronic circuit that provides input to another electronic circuit.


DVD (Digital Versatile Disc). A digital disc can hold up to 17Gb of data, nearly 30 times the capacity of a CD-ROM. DVD drives are able to read CD-ROMs as well as conventional audio CDs. The motion picture industry has already begun compressing full-length motion pictures on DVDs, using the MPEG-2 algorithm, which is known to be better-than-broadcast TV quality.

ETHERNET. A local-area network (LAN) standard.





GUI (Graphical User Interface). A computer interface based on pictures rather than text. Windows, MacOS, Netscape are examples of GUI products.

HDTV (High Definition Television). Because of the larger picture size (16-by-9 display ratio for HDTV versus 4-by-3 for regular TV) and more horizontal picture lines, HDTV will have a higher quality display than conventional TV. Also, HDTV has CD-quality sound and involves digital transmission instead of analog (Digital TV offers more than just a higher quality picture, including everything from e-mail to video-conferencing).

HIGH SIERRA - ISO 9660. A format for placing files and directories on CD-ROM. It is one of the most versatile CD formats since it can be read in most of the computer platforms.

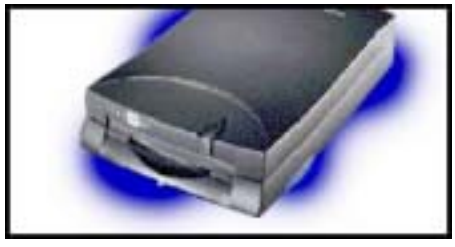
HOST. A computer that acts as a file server. Users at remote computers (i.e. client computers) are allowed to access information that's stored on the server, or host computer.
ICR (Intelligent Character Recognition). Scanning device / process for hand print recognition.

ISDN (Integrated Services Digital Network). A network / telephone connection that transfers data at rates more than 4 times faster than a 28.8Kbps modem. Ordinary modems (non-ISDN) convert computer data to audio tones / analog to transfer over the phone lines. ISDN "modems" connect digitally: Inherently faster digital signals rather than tone signals transfer over the lines.

JUMPER. A wire which connects a number of pins on one end of a cable only. Jumpers allow us to change the SCSI ID number of peripheral devices.

LCD (Liquid Crystal Display) panels connected to computers allow the display to be projected on a screen. Active-matrix LCD panels in laptop computers are preferable since they offer better display. Monitor companies started to produce LCD panel monitors for desktop computers too, these monitors are 3-4 times more expensive than the regular CRT (cathod ray tube) monitors. LCD displays emit less radiation.

MAGNETO-OPTICAL (MO) Drives / Cartridges. MO drives store data on removable, rewritable disc cartridges, each with a capacity of 640 Mb (soon to be 2.6 Gb). When filled, you swap in another cartridge. Thus, instead of buying a new hard drive (at $500), you buy another cartridge ($30). Contrast with ZIP drives by Iomega which store only 100-250 Mb.



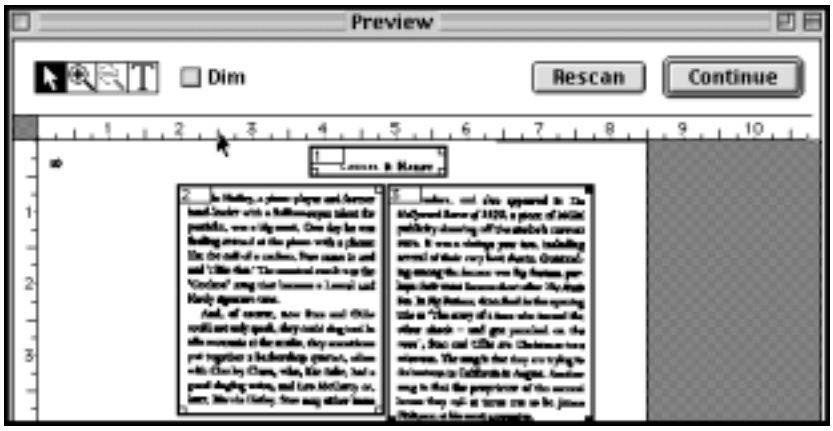
MIDI (Musical Instrument Digital Interface). Industry standard connection for digital control of musical devices. Rather than recording sounds, MIDI instruments / software record finger action - what note is being played, when, and for how long. To playback MIDI files, you need a sound card that can interpret the MIDI note data, either by creating the tones themselves (FM-synthesis) or playing back sounds that are stored internally (waveform).

MMX (Multimedia Extension). A multimedia accelerator in Intel's Pentium processors that speed media and communications processing 40 to 60%. Standard Pentiums move 1 byte of data at a time into the CPU for processing. In contrast, MMX Pentiums move 8 bytes, all processed simultaneously. Not all application programs, as yet, have been written to take advantage of the specialized instruction set for the MMX's, hence you see no performance improvement for most programs currently on the market.

MODEM (MOdulator / DEModulator). A hardware device that converts waveform (analog) data to digital. MOdulation converts analog to digital; DEModulation converts digital to analog. Modems can be attached to computers both internally and externally.

MULTI-SESSION. A CD-ROM drive that can read CD's that have been updated / changed. As CD's are updated, new directories are written, with the newer directories written further and further out to the edge. Multi-session CD-ROM drives begin searching for directories by reading out to in, thus can find the furthermost directory. Single-session CD-ROM drives begin searching for directories from the inside out, thus only the first directory nearest the hub would be encountered.

NTSC (National Television Standards Committee). Composite signal standard adopted by TV and videos in the US, Canada and Japan, with a frame rate of 30 fps (actually 29.97fps).




PAL, SECAM. PAL (used in Australia and western Europe) and SECAM (used mostly in France) are international / European standards, using 25 fps.

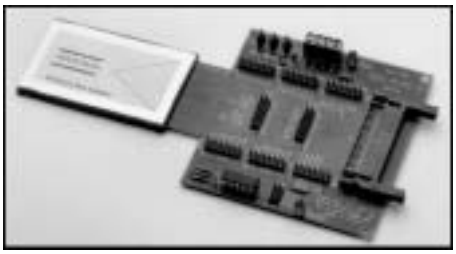
OCR (Optical Character Recognition). Scanning / process for machine print recognition.

ORANGE BOOK. Standard for WORM (Write Once Read Many) CD's. Used for archiving / backing up catalogs, directories and other computerized paperwork.

PARALLEL PORT. Also called "printer ports", parallel ports transfer several bits simultaneously. Thus, they are faster than serial ports. However, they can only send, not receive, information; whereas serial ports can handle 2-way transmission.

PCI (Peripheral Component Interface). Very fast I / O bus (with potential of 132 Mbps transfer rate).


PCMCIA (Personal Computer Memory Card International Association). A type of interface card used with portable computers and some computer peripherals like digital cameras, palmtop organizers, etc.




PERIPHERAL. The input / output and data storage devices attached to a computer such as external disk drives, printers, keyboards, displays, data acquisition systems, scanners, digitizer tablets, ZIP / JAZ drives, etc.

Photo CD. Kodak's technology for storing images on CDs, for printing, computer display, HDTV display. It accommodates five various resolutions of the same image (4, 8, 16, 32, 64 base). Your Photo CD comes with a contact sheet, showing small pictures of each image (i.e. thumbnails) on the disc. You can keep adding pictures to the CD. To view the CD images, you need a viewer. Nowadays, many multimedia programs can import these already-digitized image files into documents.

PORT. A place of access to a device or network, used for input / output of digital and analog signals.

PROCESSOR (CPU or Central Processing Unit). The computer's brain. The higher the number, the more powerful the processor and the faster it can think. For example, from slowest to fastest are the 286, 386, 486, Pentium-75, Pentium-90, Pentium-100, Pentium-120, Pentium-133, Pentium-166, Pentium-II 300, Pentium-III 450, AMD 650, Pentium-III 800, AMD 1GHz, etc. Both the 286 and 386 are largely obsolete today, and fewer 486's are being sold.

PUSH WEB TECHNOLOGY. Also referred to as "Web-casting" or "channel-casting", this technology publishes / broadcasts personalized information to subscribers. Then, instead of using bookmarks and search engines to pull down information, users would run a client application that gets updated with data that is "pushed" down by a server.

RAID (Redundant Array of Independent Disks). Stacked hard drives.

RAM (Random Access Memory). How much data the processor can manage at any one time is known as RAM. While 64 to 128 megabytes of RAM is standard on most computer systems, get 256 megabytes if you can afford it. Your software will run more efficiently. Either way, make sure your RAM is expandable so you can add more later if you need to. Information in RAM is lost if the computer crashes or electricity goes off. The solution to the latter problem is to buy an Uninterruptible Power Supply (UPS). A solution to both problems is to save very frequently.

RED BOOK. A music CD.

RISC (Reduced Instruction Set Chip). Motorola 601 RISC chip executes about 3 instructions per clock cycle.

ROM (Read Only Memory). Computer memory in which data can be routinely read but written to only once using special means when the ROM is manufactured. ROM is used for storing data or programs (e.g. operating systems) on a permanent basis.

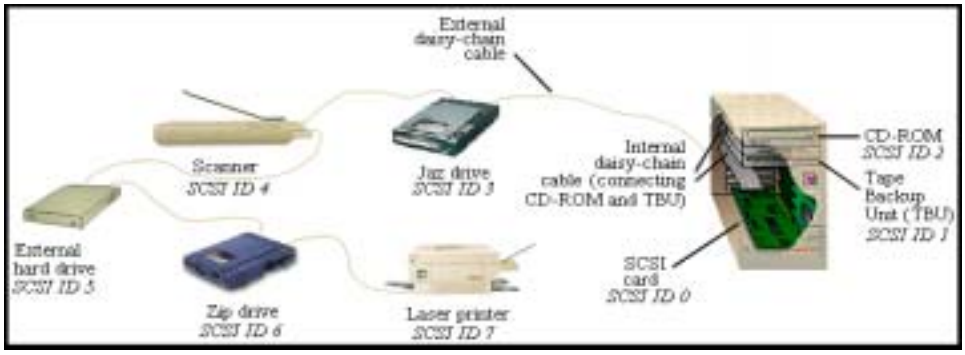
SAMPLING. When converting video or audio waves to digital format, digitizing software picks out points along the wave and records or "snapshots" these points. These "snapshots" can then be replayed in much the same way that motion pictures are recreated from the individual frames. The higher the sampling rate, i.e. the more snapshots / points, per unit time, the more accurate the computer's representation of the wave. The sound is recorded, or sampled, at regular intervals. The interval is referred to as the sample rate. The higher the sample rate, the more storage it requires and the higher the fidelity of the recording. Music CDs are usually sampled at 44.100 kHz; 48.000 kHz samling is getting popular these days.

SCANNER is a device to allow converting pictures into digital format. Most scanners work by lighting an image and measuring the light reflected through it. The scanner them converts the

reflections into distinct voltages which are, in turn, transformed into patterns of dots. The resolution or clarity of the image is measured in dots per inch (dpi or DPI).



SCSI (Small Computer Systems Interface). A fast general-purpose system interface for connecting computer peripherals such as hard drives, scanners, printers, CD-ROM drives, and so on. Allows a computer to connect (or "daisychain") up to 6 peripheral devices. You need to turn the computer and all the peripherals off in order to change the sequence in SCSI chain. All the peripherals connected need to have a separate ID number in a SCSI chain, otherwise there will be conflicts, the computer will not operate smoothly and it will not be able to read from the peripheral devices. Both ends of a SCSI chain need to be terminated.




SERIAL PORT. Used for 2-way communication, serial ports transfer data one bit at a time. Many devices, including modems, scanners and laser printers, connect to serial ports.

SOUND CARD. An add-in circuit board that once installed, enables the computer to accept audio input from a microphone, edit / trim / mix recordings, play sound files stored on disks or CD-ROM's, and produce audio output through speakers or earphones. For output, sound cards can 1) create or synthesize sounds, like a keyboard / synthesizer, and 2) play previously-recorded sounds, like a tape recorder / player.

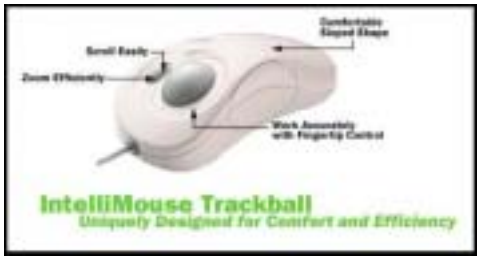
SURGE. A sudden change (usually an increase) in the voltage on a power line. A surge is similar to a spike, but is of longer duration. Computers need to be protected from surges. There are outlets that come with surge protectors and these are cheap solutions to the problem. Some UPSs (Uninterruptible Power Supply) provide surge protection too; when a surge happens they act as if the electricity is cut off and put their battery in charge for supplying power.

SVGA (Super-VGA). Video monitor / card supporting 640x480 resolution (or greater) with 256 colors or more.

SXGA. Super enhanced graphics adapter. Able to display millions of colors at screen resolutions more than 1024 x 768.

SyQuest. An older but proven removable data storage technology in 44Mb, 88Mb, and 200Mb 5.5 inch cartridges or 105Mb and 270Mb 3.5 inch cartridges.

TOUCH SCREEN. Monitor input where you can use your finger to draw on a screen or select an on-screen object. Touch screen technology is often used in ATM machines or in malls, for example, in electronic information kiosks / directories.




TRACKBALL. Operating like a mouse, a trackball remains stationary while a ball on its top is rolled with the fingers. Because you don't move it around the desk / mousepad like a mouse, it takes up less space.

UPS (Uninterruptible Power Supply). A power conditioning unit placed between the commercial power service and the protected device. The UPS uses line power to charge batteries, which, in the case of a power failure, can drive electronic circuitry to produce the appropriate AC requirements for some time period.

USB (Universal Serial Bus). A new system interface standard for connecting peripherals. It is possible to chain more than 100 devices at one time. You don't need to turn the devices off when you add / subtract to / from the chain. Data access / copying speed is slower than SCSI for now. There is


no need to mess with ID numbers, just plug the USB cable and have your device ready for use. There is no need for termination. USB-2, which is expected to be a faster protocole, is about to be introduced to the market. Firewire, which is not compatible with USB, is similar to it in terms of connection, yet it is faster than USB. If you have two external storage devices with Firewire connections on, copying is possible with the help of a single Firewire cable and without the need for a computer and monitor.

VGA. Video monitor / card supporting 640x480 resolution with 16 colors. (Also covers resolutions of 320x240 with 256 colors.)

Video CD-ROM. A CD-ROM standard that uses MPEG to store up to 74 minutes of digital video on one CD-ROM.

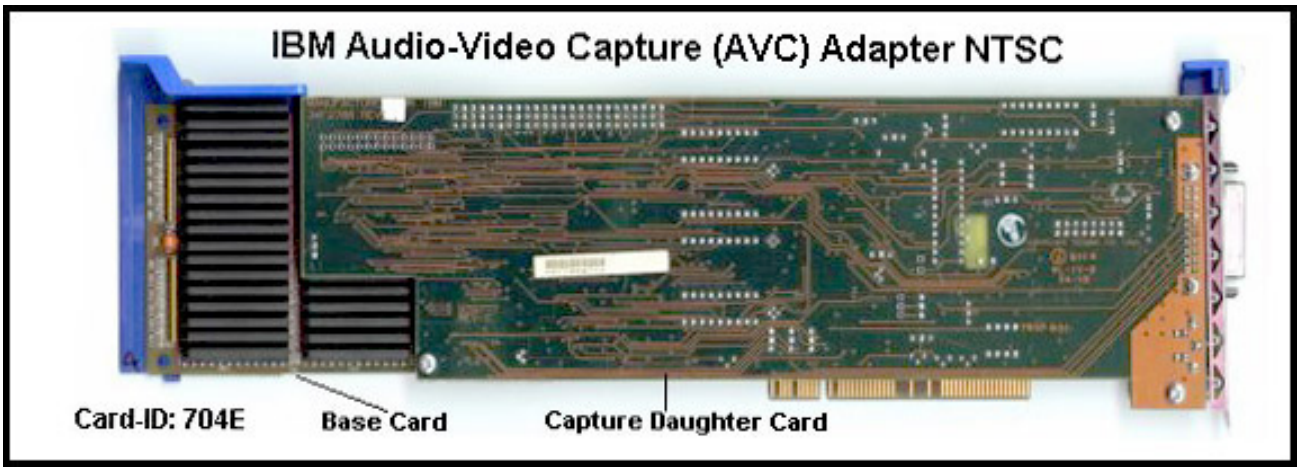
VIDEO SCAN CONVERTERS. Convert computer RGB signals to NTSC, PAL or SECAM video signals. Once converted, these signals may be videotaped or shown on a television monitor.

VIDEO - ANALOG. True full-motion video from videotapes. Formats: Hi8, 8mm, S-VHS, VHS

VIDEO - COMPONENT. Used in Hi8 and SuperVHS cameras, component video splits the single composite video signal into colors (RGB) and improves the quality by adding a luminance or brightness (Y) channel and a color / chroma intensity (C) channel. Superior to composite video.

VIDEO - COMPOSITE. Single-signal video, used in VHS. Inferior to component video.

VIDEO - DIGITAL. Digitized video, i.e. video converted / compressed to file format. Formats: .AVI (Video for Windows) and .MOV (QuickTime / cross-platform for both Macintosh and Windows).




VIRTUAL MEMORY. A method of making disk storage appear like RAM memory to the CPU, thus allowing programs that need more RAM memory than is installed to run in the

system. This technique is slow compared to "real" memory, since virtual memory uses hard disk space and access to hard disk is much slower than access to memory chips.

VRAM (Video RAM). Special memory chips residing fast video cards. The more memory, the higher the resolution. For example, to put out 256 colors you need 512K of video RAM; for 16.7 million colors, you need 2 Mb.

XGA. Enhanced graphics adapter (1024x768 pixels).

YELLOW BOOK. CDs for computer programs and data.

ZIP / JAZ DRIVES. Removable, floppy-disk drive alternatives. Iomega's ZIP (low-end) and JAZ (high-end) disks accommodate 100 / 250 Mb and 1Gb / 2Gb of storage, respectively. The drives cost about $100-150 and $300-400, respectively, and individual cartridges cost $10 and $80-90 (for 1Gb) respectively. With access speeds close to hard disk rates, ZIP / JAZ cartridges / drives can replace hard disks for many uses, including large video file storage.