



## *Buying Guide*

Buying a new computer can be a very complicated and frustrating experience. There is so much to know, so many questions to ask, and so much technical information to digest that many shoppers have a negative experience when purchasing their computer. This document is provided as a general guide to help you find the right computer for your needs. While we hope your next computer will be a VOS computer, this guide should help you no matter where you eventually make your purchase.

A computer is really only a box of parts bolted together and loaded with an operating system. So why should you care what is inside of it? It is the quality and type of these parts that make a good system. This is what separates a Dell or HP from a VOS computer. We want you to know what's inside, and we're not ashamed of what we build with! Here are some things to look for and some questions to ask.

### **CPU**

The **CPU**, or **C**entral **P**rocessing **U**nit, is the brain of the computer. Most CPUs are made by either Intel or AMD. There are 3 different aspects that will affect the overall performance of a CPU; they are Clock speed, Cache size, and **F**ront **S**ide **B**us speed (**FSB**). The clock speed of a CPU is measured by gigahertz (GHz). Numbers such as 2.8, 3.2, or 3.6 GHz are referring to the clock speed of the CPU. AMD uses a performance based modeling system instead of GHz. For example, a 3200+ Athlon would be equivalent to a 3.2 GHz Pentium 4. The cache on a CPU is used as a temporary storage area where frequently accessed data is stored for faster access, after the CPU cache is full the system will start to store this information in the RAM (*see article on RAM for more info*), therefore the larger the cache the less the time the system will spend transferring data to the RAM. The front side bus (FSB) is the speed in which data is transferred between the CPU and the rest of the components in the system.

Intel produces Celeron (single core), Core 2 Duo (dual core), and Core 2 Extreme (quad core) CPUs. The Core 2 Duo and Core 2 Extreme come in several bus speeds; going up to 1333 MHz. All of the recent Core 2 Duo processors have a minimum of 4MB of cache size. Intel Celerons use slower clock speeds, slower bus speeds, and less cache.

AMD, a competitor to Intel, is an alternative for home users and businesses alike. AMD processors, while not as fast as some of today's Intel processors, do offer a cheaper solution for basic home or business users. The latest AMD CPUs include the Sempron (single core), Athlon 64 (single core), Athlon 64 X2 (dual core), and the AMD Phenom (Quad core). AMD has also come out with a lower energy desktop processor known as the LE.

If you are looking for a high end computer system, or just want to keep up with technology then it is recommended for you to purchase a system with an Intel Core 2 Duo processor as these revolutionary chips are fast surpassing AMD in clock speed, cache size, and FSB speeds.

## Motherboards

All of the parts in a system connect in some way to the motherboard. The reliability and performance of a computer is due, in no small part, to the quality and type of motherboard.

Modern computers should have an ATX-style motherboard. This is the industry standard. Performance class systems should have a motherboard that has a PCI Express x16 slot for the video card. All motherboards should have plenty of extra slots for future expandability, and the ability to easily upgrade RAM and other components later on. Find out how much of a processor upgrade the board will take. It's nice to have some headroom for a CPU upgrade down the road.

Newer Intel based systems should have a motherboard that will support a **Front Side Bus (FSB)** speed of up to 1333MHz. A newer AMD based system should have a motherboard that will support a 1066MHz front side bus as AMD does not yet support bus speeds at 1333MHz. The motherboard bus speed needs to match the bus speed supported by the CPU for best performance.

Brand name and reliability are very important with a motherboard. Ask what parts are being put into a system. You should be able to get an answer to this question. If not, be suspicious. Do some research on the board by checking the internet and going to the proper website. There may be little information on a no-name board, and this too should raise suspicion.

## RAM

**RAM**, or **R**andom **A**ccess **M**emory, is another key part of the system. With the demands of current software, in Windows XP 256 MB should be the bare minimum, with 512 MB or more preferred. If you are purchasing a system that comes with Windows Vista then you should consider getting 1 GB of ram or more in the system. If you are going to be dealing with advanced graphics programs, games, scanning, web page design, etc, then you may want to buy even more RAM. 1 Gig is becoming common on many systems. Most modern systems use DDR2 (Double Data Rate 2) RAM. This memory is the latest memory in production today, ask if the system that you are buying has this type of memory, if not then the system you are buying can't be referred to as "new". There is an old saying that you can never really have too much memory. Buy all you can afford.

RAM has gradually increased in speed over the years, reaching speeds of up to 8.5 GB/s transfer rate. DDR RAM comes in various speeds, 266 MHz (PC2100), 333 MHz (PC2700), 400 MHz (PC3200), etc. The newest RAM, DDR2 is even faster than standard DDR memory. There are several speeds of DDR2 memory including 533 MHz (PC4200), 667 MHz (PC 5300), 800 MHz (PC 6400), and 1066 MHz (PC 8500). DDR2 memory is not backwards compatible with standard DDR memory as the notch in the ram was moved in this new design.

## Hard Drive

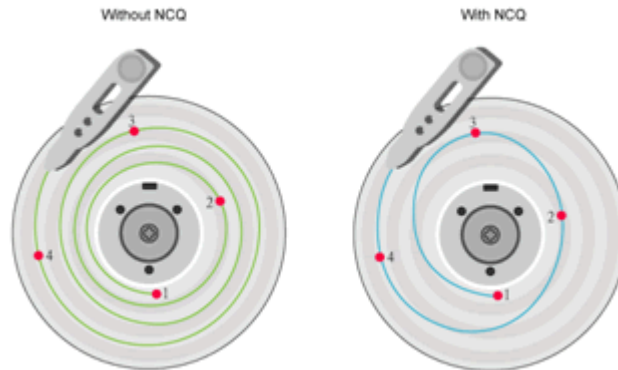
Hard drives have become cheaper, larger, and more reliable in recent years. As software programs and operating systems have become larger, drives have become larger as well. Drives holding from 80 to 750 gigs or more are common. Brand names are very important with hard drives in regards to speed and reliability. The best drives are the big names, such as Seagate or Western Digital. Avoid off-brand drives at all cost. Your data depends on it.

In addition to size, you will see terms such as "IDE" and "SATA" thrown around. The newer SATA drives are becoming more prominent. IDE has for the most part been faded out and is no longer in use on newer systems. The difference is speed, with SATA being up to 3x faster than IDE. SATA II drives are the newest to the

market and have quickly becoming the industry standard. SATA II reaches speeds of up to 3.0 GB/sec. This offers an increase in performance over traditional IDE or the original SATA.

SATA hard drives also employ a new technology not available on any IDE hard drive. This technology is called **Native Command Queuing (NCQ)**. This revolutionary technology is one of the ways that SATA hard drives have surpassed IDE in performance. NCQ is a technology that will order the requests that the CPU sends to the hard drive. A hard drive without NCQ will respond to the requests of the CPU in sequential order from when they were received, this means that the hard drive will have to spin around multiple times to get to all of the requests. NCQ will order the requests in a way that will allow the hard drive to only have to spin around once to get all of the data requested by the CPU.

### **Example:**



The size of the hard drive you need is determined by what you will be doing with your computer. Storing large graphics or music files, scanning, and gaming may require a lot of hard drive space. If you don't get enough drive space now, it is possible to add a second drive down the road if you have enough room in your case to do so. Again ask questions!

## **Cases and Power Supplies**

Often overlooked, but very important, is the case the computer is built in. The case should give you enough room for expansion. You may want to add a second hard drive some day, or add a CD burner, or a DVD drive. You will need some extra drive bays to do this. The case has a lot to do with the upgradability of the system. The case should be stout and strong, and provide a heavy metal for shielding (radio interference). Tiny cases, while being cute and cuddly looking, can lead to overheating issues, and excessive heat is the kiss of death for computer components.

Look for a power supply of 350 watts or more. Nothing less. If you are considering an Dual core system, a 400 watt or larger power supply is important. If you are going to add lots of hardware into your computer a large power supply is a must have. High-end video cards often need to be plugged directly into the power supply, which is another reason to go with a higher capacity model (often needing 500 watts or more). Generic and substandard power supplies can also damage other parts in the computer if they fail. Many mass-merchandised computers (including national brands) have inadequate power supplies. The Dells and HPs of the world come up painfully short in this area. Even if you don't know one power supply brand from another, simply lifting a good power supply side by side with a cheap generic unit will tell you a lot. Very often the cheapies are light as a feather, and have a lightweight warranty to match.

A true ATX case and quality power supply will allow you to upgrade in future years by changing out the motherboard and CPU as well as adding more components like DVD burners, or media card readers. Some of today's cases also include cold cathode light kits and windows in which to view or "show off" your system. Aluminum cases have entered the market. Their ability to help dissipate heat and decrease weight are two of the

main benefits besides having a nice look. Computers no longer have to be beige or black. Many case colors are available as well.

## **Video Card**

The video card is what the monitor plugs into, and is what causes images to appear on the screen. Today's systems need a PCI Express video card to reach its performance potential. AGP was the older standard, and that technology is significantly slower.

The amount of memory on a video card will determine how much color depth (number of colors) the monitor will display, what type of resolution can be displayed, and how fast the data can be displayed on the screen. For most users, a 128 MB card is satisfactory. Gamers or performance users should consider a fast 256 MB (or more) card. The type of memory on the card will also play a part in how well the card performs. DDR (double data rate), for example, is much faster than a card than SDR memory. DDR3 is the fastest video memory available today and is usually on the faster cards.

The video card market has been scaled back from what it once was. The majority of today's video cards have GPUs, or **Graphics Processor Units**, made by either Nvidia (GeForce), or ATI (Radeon). Video has made huge strides in recent years both for average Windows use and for gaming.

There also have been a growing number of video cards that are not really video cards at all, but are built onto the motherboard. These "cards" often share the system memory, thereby reducing the amount available for the operating system. They also make the system difficult to upgrade in the future (see section on "Integrated Systems").

It is common to see many computer makers skimp with a cheap video card. It is not possible to make a slow system fast by using a great graphics card, but it is very easy to make a fast system slow by using a poor graphics card.

## **CD ROM and DVD Drives**

Drives are rated as "something X", this translates to "52 times faster than the original 1x CD," where 1x equals 1.5Kbps. In reality, there is not a lot of difference between a 44x or a 48x and a 52x. The number represents the maximum speed the CD may obtain, but the actual transfer rate will vary depending where the data is being read on the CD. A CD is simply a spinning disc, so the data will be read faster from the inner, smaller part of the CD than the larger outer circle, which explains the varying transfer rate.

For those interested in viewing movies on their computer will want to consider adding a DVD drive. Like the DVD in a home entertainment system, the computer DVD drive allows you to view movies on your monitor. A DVD drive also doubles as a standard CD ROM drive. DVD burners are also becoming very popular. There are speeds are up to 4x, (this is equal to 9x that of a standard CD burner). These disks hold 4.7 GB of data. Double layer DVD drives can hold even more data (8.5 gigs per disk). There is no reason to settle for anything other than a double layer given how quickly the price has dropped. New DVD burner drives might also come with Lightscribe, this function will allow the user to have a picture burned on to the top of the disc, to use Lightscribe you must have a DVD burner that will support it, along with Lightscribe capable software and blank Lightscribe discs.

CD and DVD burners allow you to write data and music to a blank CD like you would write to a floppy or hard disk. This allows you to make your own CD ROM disks. These drives can also read CDs like any other CD ROM drive. The higher the numbers, i.e. 12x8x32, 16x10x40, 52x32x52, the less time it will take to "burn" the data onto a CD. These numbers represent the speed with which the drive can write to a blank disk, write to a re-

writable disk, and the largest number being how fast it can read a disk. Most drives sold now are capable of writing at these high speeds. Brand and quality are important when buying a burner.

## **Sound Card**

Every system should have a sound card, either as a separate card added to the system, or integrated onto the motherboard. If the sound is onboard the motherboard, it should have an option to disable it. Since many onboard sound cards are “softsound,” which depends on the system’s CPU to do its work for it, upgrading to a stand-alone sound card will offer some increase in overall system performance.

The most common sound cards are from Creative Labs. Audiophiles and gamers prefer advanced cards, such as the SoundBlaster Audigy that offer better sound and performance. If sound is important, consider upgrading to a better card like the Creative Labs X-Fi sound card.

## **USB**

**USB**, or **Universal Serial Bus** should be considered standard equipment on any new computer. USB allows you to easily connect many things to your computer such as a scanner, camera, or printer. More and more external devices are now designed with USB interfaces. The new standard is USB 2.0, which replaced the older and slower USB 1.1 standard. USB 2.0 is especially important if you are connecting a speed-dependent device like an external hard drive to your computer.

Modern cases now offer USB ports that are in the front of the case as well as in the rear. This can be a very nice convenience if you have a device such as a camera or storage device that is being plugged and unplugged often.

## **Speakers**

If you just want to hear Windows sounds, some music, and wave files, then basic stereo speakers are fine. However, if you like to listen to a lot of music or play games, then speakers with a sub-woofer will be a great upgrade to the system. The sub-woofer will provide better bass response than small speakers by themselves simply can’t put out. Multi-speaker set ups are available to those who require the best in sound reproduction including surround sound for DVDs or games. A good set of speakers can help you get the most out of your sound card and make your games come alive.

## **Modem and Network Cards**

Many systems include a modem. If you are going to connect to the internet via a dial-up internet connection, you will need a modem, and 56K is as fast as they go. Most internet providers support the current V.92 standard. If you have a cable modem or a DSL connection, you wouldn’t need a standard modem. Broadband internet has become much more common in recent years; cable companies are hard at work to bring fast access to everyone.

A **Network Interface Card**, or **NIC**, is a device that allows you to connect your computer to other computers on a network. A network allows you to share files and printers across the network. NICs can be in the form of a stand alone card or built onto the motherboard. If you are going to connect two or more computers together (even in a home environment), or are going to have a broadband internet connection, you will probably need to have a NIC.

Network cards are also available as a wireless card, this card is designed to receive a signal from a wireless router wirelessly instead of having to run cable from the router to the computer. If you want to convert your household network to a wireless network you should check to make sure your computer will have a wireless card installed in it.

## Monitor

Here is a place where you will not want to cheat yourself. You are always looking at the monitor when you are using your computer. Bigger is nicer, and of course more expensive. A 17" monitor is the entry-level size, and 19" and 21" are common sizes for upgrades. Smaller 14" and 15" sizes are a thing of the past.

Flat panel (LCDs) monitors are now common place, and are replacing older CRTs. They are thin, are very bright, take up little desk space, and have a wonderful picture; they have recently been dropping a lot in price and are now not much more than a new CRT monitor. A *flat panel* display is not the same as a *flat screen* monitor, which has the bulk of a regular CRT monitor, but a true-flat screen. Key things to consider with LCDs are the *Contrast Ratio* and the *Response Time*. Lesser quality LCDs won't measure up in these areas.

Older technology tube (CRT) monitors are still around. While not as slim or stylish as a flat panel, they are cheaper and offer a crisp, clear picture.

## Integrated Systems

In recent years, the industry has seen a growing number of low-cost integrated motherboards. Sometimes called Micro ATX, they usually have on-board sound and video, and often built-in modems or network cards. They are much cheaper than traditional industry standard motherboards, with a small, non-upgradable case, resulting in a very low-cost system.

Integrated type systems have little, if any, upgradability. They are best viewed as a disposable system. Because of the low price they are attractive to many first-time buyers who may not know any better. They are fine for basic computing tasks, getting on the internet, and running basic programs. Be aware that if your needs change, these systems are not going to be able to change with you like an industry standard computer. Because so much is integrated onto the main board, if one part fails, the whole board will probably have to be replaced. The problem is compounded with some brands (including some big name national brands) that are proprietary with their other parts as well, making them very difficult to repair. If you can get parts often they cost substantially more than industry standard parts. These integrated computers are common "sale items" at big mass retailer type stores or on the internet.

## Operating System

Today the operating system usually means Windows. For most people your choice comes down to either XP Pro, XP Home, Vista home Basic, Home Premium, Business, and Vista Ultimate, but there are other considerations as well. First, you should make sure you are getting a fully licensed copy of Windows. It should have a **COA** (Certificate of Authenticity) proving it is a real copy. You should check and see if you get a real Windows disk as well. Most national vendors do not provide a real Windows disk, just a restore disk. Sometimes it is even up to you to make your own restore disk. That could be a big problem if you ever need to reload your system.

## **Service and Warranty**

Any new system should come with a warranty covering the parts in the system, and the associated labor. Ask where the work will be done should service be required. Do you have to send the system away for service, or is the work performed in shop? If the warranty is on-site, is it the same people you are buying your system from, or a contracted service provider? If an extended warranty is offered, be cautious. Many parts of a system may already have a warranty that exceeds what the retailer provides. For example, the VOS limited warranty is one-year parts, two-years labor on most systems, but some parts of the system, such as CPU and hard drive, have a longer warranty through the manufacturer of that component.

## **Final Thoughts**

Buying a computer is a big investment. Shop around, ask questions, and compare features and parts. Know what you are buying, and get what you are paying for. Is the monitor included? How about the operating system? What brand is the hard drive and motherboard? A reputable shop should be able to *honestly* answer your questions. You can not compare machines based just on how much memory, hard drive, or price it has and ignore the bigger picture of what else is inside the computer.

Be careful of ads promising a lot of computer for a very small price, and be wary of “Bait and Switch” tactics with low ad specials. Check out the company you are considering buying from by contacting the Chamber of Commerce, Better Business Bureau, or State Attorney General. Closely examine ads and flyers. Don’t buy more than you need, but buy what you need. Shop for the present with an eye on future upgrades. Make buying your computer a satisfying experience.