

# Building a Computer System for Investing

by John Bajkowski

The PC industry hit a significant speed bump in 2001. For the first time since 1985, Gartner Dataquest reports that unit shipments of PCs declined by 4.2% worldwide. The market was even weaker in the United States where unit sales declined by 10.0%. Sales were down by 0.4% for the first six months of this year, but Gartner estimates that PC sales will be up 2.8% in 2002 compared to 2001. However, even a 2.8% gain represents a significant decline from the 5.4% original growth expectation for 2002.

While PC companies have grown accustomed to competing in a competitive marketplace that continuously offers faster and more powerful systems at lower prices, a slower sales environment has companies working even harder to attract customers. Prices have been declining after showing some firmness in early 2002. Name-brand vendors such as Hewlett-Packard and Dell are offering desktops and notebooks at lower price points than before, while separately still offering fully decked-out systems for gamers and multimedia-conscious consumers.

We present our annual computer guide during a buyer's market. Consumers in need of a new system are the winners in the current environment. The recommendations in our guide are geared toward the mainstream investor who is performing investment tasks such as portfolio management, stock analysis, and charting, as well as general purpose Web surfing, E-mail, word processing and spreadsheet building.

Buying a new computer can be a daunting task for the first-time shopper. Will the \$228 Microtel Linux-based system offered through Walmart.com satisfy your computing needs or do you really need to spend \$3,000 to have that high-end multimedia system? As one would expect, the answer lies somewhere in the middle for most users. Some basic education and research will help you select a system that offers

enough power to accomplish your current and expected tasks for the next few years.

A glossary of computer and investment terms can be accessed within the CI Links area of the Computerized Investing Web site ([www.aaii.com/cimember/glossary/](http://www.aaii.com/cimember/glossary/); see Figure 1).

## Defining Your Needs

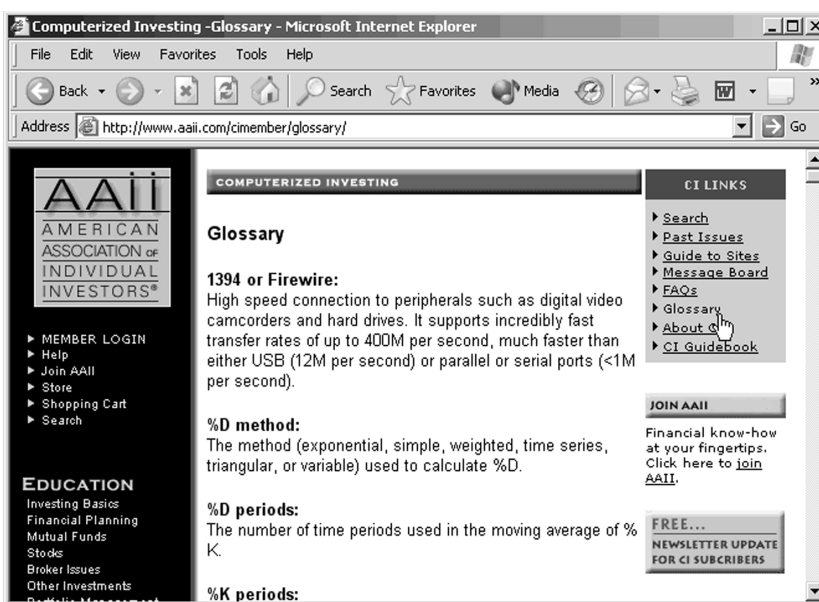
To avoid buying an inadequate system or spending too much on unused extras, take some time to determine the tasks that you will perform on your system. Ideally, you will identify what it is you want to do and purchase a system accordingly. If you're just looking to surf the Internet and exchange E-mail, a high-end system with all the bells and whistles would probably be a waste of money. Likewise, if you wish to perform technical analysis system testing and development or run other system-intensive software, a basic system would be ill-advised.

It is vitally important that you purchase a computer that supports the software you plan to use. Macintosh users

are well aware of the limitations they face when trying to locate specialized investment programs that operate on the Mac OS. It is for this reason that we continue to recommend Windows XP systems over Macintosh systems for members who want to run a wide range of investment-related software.

At this point in time, Windows XP is the operating system of choice for the individual investor. Both the home and professional versions of Windows XP are designed off the Windows NT platform, which is inherently more stable than Windows 95, 98, or Me. Windows XP offers support for a wider range of hardware add-ons and even software programs, which was weaker in prior NT releases. NT and Windows 2000 were primarily designed for the corporate marketplace, so Microsoft never tested it for compatibility with a wide range of consumer software and did not provide drivers for the full complement of devices—such as printers, MP3 players, and even video cards. We have come across software that will work on Windows 98 and Windows XP, but

**Figure 1.**  
**Glossary of Computer Investing Terms on AAll.com**



**Table 1.**  
**Computer Usage Among AAIL Members**

Percentage of AAIL Members	2002	2000	1998	1996	1994	1992
Percent of members that own a PC	95.7%	90.3%	84%	80%	80%	73%
Type of system used:						
Windows	92.4%	91.0%	90%	80%	84%	76%
Macintosh	7.2%	9.6%	10%	19%	14%	16%
Other	0.4%	1.8%	2%	5%	3%	12%
Regularly use the Internet	89.1%	84.0%	—	—	—	—
Internet Connections: Modem	68.2%	88.0%	—	—	—	—
Internet Connections: Broadband	33.9%	15.0%	—	—	—	—

not on Windows 2000.

Windows XP comes in two versions—Home Edition and Professional. The fundamental core and interface is the same for both systems, but the Professional version has additional security, networking, file sharing, system restoration, and multi-processor support. For most single-computer households, Windows XP will suffice unless you need to connect to a corporate network.

The eMac, iMac, iBook and PowerBook are popular systems and have been strongly influential products. Table 1 highlights a survey of AAIL member computer usage over the last 10 years. Currently, about 7% of AAIL members with a computer rely on Mac OS versus 92% using Windows. Another 0.4% employ other operating systems such as Linux.

Apple released an operating system upgrade in 2002 titled Jaguar, which includes over 100 enhancements and new features. The operating system builds upon the Mac OS X by incorporating easier and more advanced network connections. Jaguar incorporates networking technology termed Rendezvous that allows Macs to automatically recognize each other and share peripherals. Rendezvous will even automate the connection of a Macintosh to a Windows network. Other notable features enhance the Internet experience with an upgraded E-mail program that includes a junk mail filter and the collection of data over the Internet without the use of a Web browser. New Macs ship with Jaguar, while upgrades cost \$129 for a single system and \$199 for a family license that covers up to five computers.

Mac systems remain good choices for Web browsing, E-mail, word processing, and spreadsheet work. However, investment software for the Mac user remains scarce. The majority of Mac investment offerings are personal finance programs such as Quicken.

### Intended Uses

Depending on what you want to do with a computer, especially in terms of computer-assisted investment analysis, you will require a system with certain capabilities.

Technical analysis is probably the most system-intensive work in the realm of investment analysis. This type of analysis relies on the manipulation and graphical display of a great deal of data—typically daily data over several years. In order to perform such tasks, a computer requires a processor that can quickly perform calculations. Furthermore, a high-quality monitor and possibly a color printer are necessary to examine and print charts and graphs. If you are looking to store a large amount of historical data for many companies—typical of disk-based fundamental screening and analysis programs—a large hard drive would be useful. For day-to-day downloading of data or for extensive Internet-based research, a high-speed connection is desirable. In contrast, most portfolio management programs require more simple processing requirements and, likewise, a less advanced computer.

While shopping for a new computer system, you need to be forward-thinking: Where will computing be in the future, and what will your computing needs be down the road? As you de-

cide which system you are going to purchase, be mindful of both your current and potential future needs.

### The Sum of Many Parts

When you think of a computer, you may think of a singular item. However, a computer consists of various components, such as the processor, hard drive, disk drives, and

video and sound cards. Each component requires a certain amount of understanding to make sure that you create an overall system that is right for you. The major components are discussed below.

### Processors

In the overall scheme of things, the processor is one of the smallest pieces of a computer system, but without it the computer is rendered useless. The processor (CPU) is the brain of the computer. The faster the processor, the faster the computer is able to execute operations and perform calculations. However, the support system must be up to the task of supplying data and instructions to the processors and then acting upon the instructions of the processor. Chip (processor) manufacturers are continually battling each other for the title of fastest processor. Consequently, faster and more powerful processors enter the market every few months. In fact, Moore's Law (credited to the co-founder of Intel) states that processor speeds double every 18 months.

While Intel has been the undisputed king of processors for several years, it has faced strong competition from AMD over the past few years. Intel holds the fastest clock speed title with its 2.80 GHz Pentium 4 processor, but AMD indicates that its Athlon chips process information more efficiently at a given speed rating. A new wave of processors is expected from both Intel and AMD and promises faster clock speeds and hyper threading, which will allow for more efficient processing at a given clock rate. Intel's 3 GHz Pentium is expected to be released be-

fore the end of 2003, while AMD Athlon XP 2800+ is expected to hit the street early in 2003.

While the Athlon and Pentium 4 chips represent the high-end processor market, competition is just as keen in the value market. Here AMD and Intel vie for market share with the AMD Duron and Intel Celeron. These chips do not offer the processing power of their high-end cousins. However, they offer enough power for all but the most power-hungry users at a reduced cost.

Significant savings can be realized by purchasing a system slightly below the top end, which is normally priced at a significant premium. For most users, buying a Windows system with a 1.7GHz or faster processor should provide more than adequate performance for the next few years.

In Macintosh systems, chances are you'll find either a PowerPC G3 (G3 for short) or PowerPC G4 processor from Motorola. The G3 is found in the consumer-oriented iBook notebook and the low-end iMac G3 desktop, while the G4 is found in most desktops including the iMac G4 LCD system, eMac G4, and the high-end PowerMacs as well as PowerBooks notebooks. In head-to-head comparisons, the G3 and G4 rival and often outperform equivalent speed rate Pentium processors. For most investors, any of the G4 chips should be adequate. As you move up the iMac and eMac chain, faster processors, additional memory, and larger and better displays are available. The eMac and LCD iMacs are available in packages that provide a good balance of power, memory, storage, and features.

### **Data Storage Media**

As today's programs become more sophisticated, their needs grow in terms of the amount of hard disk space required for installation and in terms of the amount of memory they require for proper operation. To ensure that your computer will be able to meet the demands of today's and tomorrow's software, make sure it has an adequate amount of data storage media.

### **Memory**

In computers, temporary memory is just that—temporary. In other words, data is lost when the computer is turned off. In personal computers, RAM (random access memory) is the form of temporary data storage. The amount of RAM a system has impacts several aspects of computing, specifically, what kind and how many programs can be used on a system at the same time.

The more applications you run simultaneously, the larger the files you deal with; the more complex your operating system, the more RAM you will need. Even with a top-of-the-line processor, a lack of memory can hinder your system's performance. The graphical operating systems available today—Mac OS X v10.2 (Jaguar), Windows Me, and Windows XP—all benefit from additional memory. Most low-end systems ship with 128M of RAM, while mid-range systems typically offer at least 256M of RAM. Some systems share video memory and program RAM memory. This is especially common with a lower-end system. You should inquire whether a system shares its main memory with the video system and purchase additional RAM to compensate.

We recommend that you purchase a system with 256M or more of RAM. On a desktop system, upgrading from 128M to 256M will probably cost you less than an additional \$30 to \$50, while an additional 256M should run from \$60 to \$100. Upgrading memory is money well spent. When prioritizing various components of a new computer, you would be better served by forgoing a more powerful processor in favor of purchasing more memory.

There may come a time when you wish to add additional memory to your computer. Two things will impact your ability to do so—the number of slots the computer has, as well as the maximum amount of memory the system can handle. If the system has empty slots, you can simply add new memory components. However, if they are all full, you will have to remove existing memory components in order to add ones of larger increments.

### **Hard Drives**

Temporary memory, as we have shown, is an important element of a computer. Inevitably, however, the need will arise for you to save data so that you can use it at a later time. This is where permanent storage comes into play. With permanent storage, the data is retained once the computer is shut off. The primary type of permanent storage found in personal computers is the hard drive.

The matter of greatest practical importance when choosing a hard drive is its size. Today's operating systems and many of the applications on the market can demand a great deal of available disk space. As you look at new computers, you should purchase one with a hard drive that has a capacity of at least 40G (gigabytes). Laptop users may have to settle for a smaller drive. While this may seem like a tremendous amount of storage space, keep in mind that if you are going to be using any type of real-time or historical data service, you will want to have the capacity to store this data. Outside of a computerized investing context, if you want to do work with multimedia files—MP3s, digital photos, or digital videos, you will need sizable amounts of free hard disk space.

### **Floppy Drives**

While not as glamorous as a processor, a floppy drive is still useful—make sure your system has one. Beyond providing long-term storage, backups and file transfer, floppy drives are invaluable in the event of a major system crash. Using your floppy drive, you are often able to boot, or start, the system and perform some basic repairs. iMacs, eMacs, iBooks, and PowerBooks do not ship with a floppy drive, so be prepared to spend about \$100 to purchase a floppy drive that connects to the USB port on these systems.

Some vendors may offer Zip disk upgrades for desktops and laptops. These removable higher-capacity storage disks can hold up to 750M and cost about \$150. Media for the drives cost about \$13 per disk. However, in most cases, you can skip the upgrade to Zip

drives and concentrate on re-writable CD drives.

## CD and DVD Drives

CD-ROM (compact disc read-only memory) drives allow you to read data from compact discs as well as play ordinary music CDs. Compared to floppy drives, CD-ROM drives have much higher data transfer rates. However, they cannot match the transfer speeds of hard drives. As is the case with hard drives, the speed at which the CD spins translates into how fast graphics and video are read from the CD and displayed on the system. With slower drives, you may experience pauses in the video from time to time as the data is being transferred. CD-ROM drives range from eight-speed to 72-speed and can be either internal or external—although you should choose an internal CD-ROM drive if possible. An internal CD-ROM drive costs an average of \$50.

CD-R (recordable compact disc) drives allow you to save data on CDs—something you are unable to do with a regular CD-ROM drive. CDs offer a significant storage capacity—up to 700M—compared to other types of removable storage media. Furthermore, CDs are relatively cheap (about 75 cents per disk when coupled with a jewel case, and 30 to 75 cents each in bulk). While CD-Rs offer the advantage of being able to write to the CD, once one

has been cut, or written, the disc cannot be used again. CD-Rs have grown into a popular option for individuals creating custom audio CDs.

The shortcoming of not being able to re-record CD-Rs was solved with the introduction of CD-RW (re-writable compact disc) drives. CD-RW discs can be reused and read in any standard multi-session drive found on PCs. Note, however, while most consumer audio CD players can read CD-Rs, only the latest generation CD players can read CD-RWs. CD-Rs are more reflective than CD-RWs, so they can typically be read on a wider range of players (the same applies to DVDs). The average cost for an internal 32x/12x/48x CD-RW drive is around \$100 (32x is the speed of recording a CD-R disc, 12x is the speed of recording a CD-RW disc, and 48x is the reading speed). Lastly, CD-RW drives can handle CDs, CD-Rs, and CD-RWs.

DVD or DVD-ROM, which stands for digital versatile disc, has become a popular option. ROM designates the disc as read only memory. Although there are a large number of movie titles being released for DVD, software development has been almost nil, with the exception of some titles in the gaming area and reference area (such as encyclopedias). First-generation DVD drives were limited in their ability to play CD-R discs. Today's DVD drives

can read all types of CDs—standard music CDs, CD-Rs, and CD-RWs. While their usefulness is limited on desktop systems, many laptop users select DVD drives to view movies on the road.

Beyond the physical drive, you will also need a decoder to view the video contained on a DVD disc. There are two types of decoders—software and hardware. Hardware decoding is less CPU-intensive and is recommended for systems with processors of less than 500Mhz. Brand new systems should have the processing power to support software decoding—although it still places a considerable burden on the CPU which, in turn, could reduce video quality.

In addition, there are recordable DVDs that come in many flavors. The most common are recordable DVD drives that can write standard CD-Rs and CD-RWs and play DVD-ROM discs. These CD-RW/DVD-ROM combo drives cost about \$150 to \$250.

A number of competing DVD standards can read and write to special DVD discs. DVD-RAM is the oldest technology that is geared toward creating data discs. DVD-RAM drives allow users to write data to DVD discs just like CD-Rs and CD-RWs. These drives are also able to read all CD formats. The main attraction of DVD-RAM is its capacity—5.2G on double-

sided discs and 2.6G on single-sided discs. This means that for one double-sided disc, you are given the storage capacity of over eight 700M CDs, or over 3,600 standard 3.5" floppies. The problem with DVD-RAM discs is that they cannot be read on consumer DVD movie and music players. Apple has offered DVD-RAM drives on select Macs over the years, but the format has not really caught on. The alliance creat-

**Table 2.**  
**CD and DVD Drive Formats**

Format	Recording	Compatibility
CD-ROM	Read only	Standard music and program discs
CD-R	Record once	Compatible with most writable discs; properly formatted and closed discs can be read on most consumer music players
CD-RW	Record, erase repeatedly	Good for computer data storage; newer consumer CD players can read properly formatted and closed discs
DVD-ROM	Read only	Standard video distribution format
DVD-R	Record once	Compatible with most recent consumer DVD players; good for storage of videos
DVD+R	Record once	Compatible with most recent consumer DVD players; good for storage of videos
DVD-RAM	Record, erase repeatedly	Good for data storage; not compatible with consumer DVD players
DVD-RW	Record, erase repeatedly	Good for storage of videos; compatible with most recent consumer DVD players
DVD+RW	Record, erase repeatedly	Good for storage of videos; compatible with most recent consumer DVD players



ing the format now offers DVD-R and DVD-RW formats.

DVD-RW and DVD+RW both offer rewritable DVD discs but they are not generally compatible with each other (Table 2). The two formats represent a battle of two separate alliances trying to establish a de facto standard. Both formats have major manufacturer support. Until the standard shakes out, we would recommend that users desiring the ability to create DVD discs consider a multi-format drive offered by companies such as Sony that supports all of the competing DVD standards. The drive costs about \$330.

Like their CD counterparts, DVD-R discs can be written once and are compatible with most consumer DVD players.

### Zip/Jaz Drives

The industry leaders in removable storage are Iomega's Zip and Jaz drives. Internal Zip drives offer data transfer rates slightly below that of a hard drive, while external parallel and USB port drives operate at much slower speeds. Zip drives now offer 100M, 250M and 750M of storage. Zip 100 drives typically cost around \$125 and are available in both internal and external models. Zip 250M and 750M drives are also available as both internal and external and cost around \$200. The cost for an eight-pack of 100M, 250M or 750M disks is around \$90. Most computer manufacturers offer Zip drives as an additional option.

The Jaz drive offers 1G or 2G of storage capacity per disk, but it is becoming difficult to find new 1G drives. The 2G drives currently cost \$330 with a three-pack of 2G disks costing \$260. Zip and Jaz drives have become less popular options with the growth of recordable CDs and most investors do not need them.

### Backups

To save yourself a great deal of torment, it is highly suggested that you establish an effective backup system for your computer. While breakdowns of computer equipment are infrequent, crashes caused by ill-behaving software

or computer viruses can wreak havoc on your system. Abnormal program terminations, a.k.a. "program bombs," can corrupt system files and render your system inoperable. Don't wait until it is too late to implement a backup system. Backups have normally been performed on high-capacity tape drive systems, but CD-Rs and CD-RWs can also be used to create effective backups. Maxtor has introduced an interesting external hard drive that you can use as a regular hard drive, but also offers a single button press option to backup your computer's internal hard drive. The hard drive connects to USB 1.1 or 2.0 ports as well as a FireWire port. The 80G version cost about \$200, while the 120G version sells for about \$300.

### Monitors: Size Matters

While the computer itself performs the analysis and tasks, the monitor is important in that it displays the finished product. When shopping for your new computer system, make sure that the quote you receive includes the monitor, because not all companies include this cost in their computer prices. As you are comparing prices for your new system, don't attempt to save money by skimping on the monitor. While other aspects of a computer, such as the amount of memory, can be upgraded or expanded by simply adding more, a monitor can only be upgraded by buying a whole new one. The increased viewing area and clarity of a better monitor will be well worth the money (not to mention the fact that your eyes will thank you).

When looking at monitors, there are basically five critical factors to consider: size, CRT versus LCD, resolution, refresh rate, and dot pitch.

#### Size

The size of the monitor determines how much "real estate" you have for displaying data. Typical monitor sizes for personal computers range from 15" to 19". Monitors that are 21" and larger are generally reserved for desktop publishing and computer-aided design

(CAD) applications. Most new computers today come with a 15" or 17" CRT monitor. CRT (cathode ray tube) is the technology used in most televisions and computer display screens.

Upgrading from a 15" to a 17" CRT monitor is usually less than \$50 and will provide you with over 30% more viewing area. At the retail level, respected name-brand 15" monitors seem to cost around \$125 to \$200; 17" monitors cost around \$130 to \$300; and 19" monitors are selling for around \$200 to \$400. The extra cost will be more than recovered in reduced eye discomfort over several years of ownership. If you do decide on a larger monitor, keep in mind the desktop space you will need for it. A monitor is typically as deep as the diagonal length of the screen. If you are short on desk space, you may opt for a short-depth monitor, or a flat panel LCD (liquid crystal display). A 15" LCD is roughly comparable in display quality and viewable size to a 17" CRT monitor. Normally, at least an inch of the stated CRT display size is hidden behind its bezel. LCDs offer wonderful flicker-free display, but at a price premium. Expect to pay from \$300 to \$500 for a 15" LCD panel, down about \$100 from a year ago. 17" LCD panels are selling for between \$600 and \$900.

#### Resolution

A monitor's resolution is the number of pixels, both horizontally and vertically, and determines the relative size of the objects on the desktop. A higher resolution means objects will appear more clearly on the screen. When running at high resolutions, such as 1024 by 768 or higher, the need for a larger monitor becomes more apparent. At such resolutions on a 15" CRT monitor, the objects are so small that viewing becomes difficult. CRT displays are easily able to adjust between resolutions, but LCD displays are optimized for a given display resolution and do not look as crisp if stepped down in resolution to display text in a larger size. 1024 by 768 is a good resolution for 17" CRT display and 15" LCD panels.

## Refresh Rate

The refresh rate of a monitor refers to the number of times the screen is redrawn each second. This is only a concern with CRT displays. The higher the refresh rate, the less the screen flickers or strobes. Reducing the flickering of the screen lessens the strain on the eyes. For the best viewing, look for a refresh rate of at least 75Hz (hertz) for planned resolution.

## Dot Pitch

Dot pitch has to do with the distance between the phosphors in the monitor. The smaller the pitch, the clearer the images that appear on the screen. The largest you should go is a 0.28mm diagonal dot pitch, while 0.25mm or smaller offers a clearer display.

In conclusion, a new monitor should be at least 17", support a high refresh rate (at least 75Hz), and have a dot pitch no larger than 0.28mm. Purchased separately, such a CRT monitor currently costs around \$200, while a 15" comparable LCD display will cost around \$400.

## Sound and Video

With the advancements that have been made in PC audio and video the past few years, you have the potential of turning your computer into a home entertainment system. Even if this isn't your goal, most systems come with built-in audio suitable for typical users.

Most of the video boards that ship with today's computers offer both 2-D and 3-D graphics. Even if you aren't planning on doing any gaming with your PC, the extra cost is negligible. For quality 2-D and 3-D graphics, you should select a video board with at least 16M of video RAM.

Video RAM of 32M will benefit those who have monitors with high refresh rates and resolutions as well as those looking for optimal 3-D performance from games. Video cards such as these cost between \$75 and \$150.

## Printers

Printers, while technically not part

of the computer itself, are a vital part of any computer system. You will find this out when you want to print text, a Web page, or a chart. Printers, just like computers, come in many different kinds with numerous options and issues to consider.

## Inkjet Printers

Inkjet printers offer both black and white and color printing. They work by squirting liquid ink through a nozzle that forms the image of text or graphics on the page. They are fairly cheap, fast, quiet, and achieve good resolution. They support color, which can be useful for distinguishing between data on printed graphs with multiple lines or bars—often a concern when printing reports from investment software and information from the Internet. A good-quality color inkjet printer will cost \$100 and up, offering good print quality, speed, and color at a reasonable price.

## Laser Printers

Laser printers work by bonding powdered toner ink to high-quality paper under high-heat conditions. Laser printers are fast, increasingly cheap to manufacture, and produce the best output of the two technologies. Personal laser printers do not usually support color, although this technology is becoming more accessible over time. Black and white laser printers cost, on average, \$150 and up, while color personal laser printers start at around \$1,000.

The standard for resolution today is 600x600 dpi (dots per inch) for low-end laser printers, but printers geared toward reproducing photos go as high as 4,800 dpi. You should avoid printers with resolutions lower than 600 dpi. Furthermore, you don't need high resolutions such as 2,400 dpi or higher unless you plan to print high-quality graphics or digital pictures. Keep in mind that many inkjets have different resolutions for color and black and white (monochrome) output.

Take a look at both the price of an ink or toner cartridge for any given printer and the number of pages it will print. An inexpensive cartridge that prints

relatively few pages may actually be much more costly than a more expensive cartridge that prints more pages. Higher-capacity cartridges also mean you won't have to change them as often, which can be particularly important depending on how much printing you plan on doing. If you are using a color inkjet printer, look for a model that uses separate black/white and color cartridges. Some now also offer separate cartridges for each color ink. This makes it less expensive to use the printer since you don't have to replace all of the ink colors when you run out of just one.

## Modems

A modem (modulator/demodulator) allows communications between computers over POTs (plain old telephone lines) and is generally used to access commercial on-line services, Internet service providers (ISPs), or the Internet. About 68% of our members use a modem to connect to the Internet.

Today's modems are capable of using advanced error correction and data compression to achieve much higher data transfer rates than their basic connection speeds allow. A 28.8Kbps (kilobits per second) modem may allow data transfer at 115.2Kbps when correctly configured and accessing another equivalent, compatible modem.

Most new computers ship with 56.6Kbps modems. These modems allow you to download data at 56Kbps but will only allow you to upload data at 33.6Kbps. In reality, due to FCC regulations, the modems are only capable of downloading at up to 53Kbps. Furthermore, when line conditions are taken into account, the average rate you will currently achieve is up to 46.6Kbps. A V.90 56Kbps data modem can run from \$30 to just under \$200 and offers a variety of features.

## Modem Substitutes

Alternatives to modems, which tend to offer much greater connection speeds, are also available depending on your geographic location. These include ADSL (asymmetric digital sub-

scriber lines or DSL), cable modem, and satellite. DSL service is offered by phone companies, although not in all areas. It uses standard phone lines and offers theoretical download rates of 128Kbps to 8Mbps. Most services offer minimum download speeds of 15Mbps. DSL service costs start at \$40 per month, with an additional \$100 to \$500 for equipment and installation.

Cable modems also offer an “always on” Internet connection with speeds ranging from 384Kbps up to 4Mbps. Cable modem service, unlike DSL, usually does not allow you to select your own ISP—which means you are locked into one service and fee structure. Monthly fees range from \$30 to \$50. Setup costs vary by region and can be as high as \$200. Also, note that upload speeds are lower than download speeds.

Depending on your geographic location, your only high-speed Internet option may be satellite. Hughes Electronics DirecPC provides download speeds of up to 400Kbps. The service has traditionally been a one-way system that offered fast download via a satellite and slow upload speeds through your phone. Recently, a two-way system has been introduced. It remains a pricey option with high installation and monthly access fees. Lastly, the 24" dish you install outside must have a clear view of the southern sky.

### Desktops vs. Laptops

After deciding whether or not you will purchase a new computer, inevitably the question of whether to go with a desktop or laptop system will arise.

While both have their merits, their functionality (and usefulness to you) depends in large part on the intended uses for the computer.

As you analyze your computing needs and any of these concerns come to mind, perhaps a laptop will serve your needs better than a desktop:

- Do you work while traveling?
- Will you need to move the computer from room to room or location to location?
- Do you have space (desktop) constraints?

However, if your concerns tend to lie in any of these directions, a desktop may be the preferred choice:

- Will you be at one location?
- Do you plan to upgrade?
- Do you have budget constraints?
- Do you prefer a larger display?
- Are you interested in the best performance and latest features?

When dealing with desktop and laptop systems, be aware that you face differing upgrade possibilities. Desktop systems tend to be easier to upgrade and repair, largely because there are a number of “generic” components available that can be installed with relative ease and without compatibility issues. Laptops, on the other hand, are more delicate creatures and they are more difficult and expensive to upgrade and repair. If you wish to upgrade a laptop, oftentimes you need to go directly to the manufacturer to obtain component parts to ensure they function properly with the system you have.

Lastly, there is a price difference between laptops and desktops. Given two relatively identical systems in terms of computing

**Table 3.**  
**Cost Comparison: Desktop vs. Laptop**

#### Windows System

	Desktop	Ultra Compact Laptop	Mid-Sized Laptop
	Dell Dimension 2300	Dell Latitude X200 Notebook	Dell Inspiron 4100 Notebook
Operating System	Windows XP Home Edition	Windows XP Professional	Windows XP Home Edition
Processor	1.8GHz Intel Celeron	800 MHz Intel Pentium III	1.8 GHz Intel Pentium 4
Memory	256M RAM	256M RAM	256M RAM
Hard Drive	60G	30G	40G
CD-ROM	DVD-ROM/CD-RW (32x/10x/32x)	DVD-ROM/CD-RW (8x/10x/24x) External	DVD-ROM/CD-RW (8x/10x/24x)
Video Card	32M 2D/3D graphics accelerator	48M 2D/3D graphics accelerator (shared memory)	32M 2D/3D graphics accelerator
Sound	built-in audio plus speakers with subwoofer	built-in audio	built-in audio
Modem	56K	56K	56K
Network Adapter	10/100 Base-T Ethernet	10/100 Base-T Ethernet	10/100 Base-T Ethernet
Monitor	15" LCD	12.1" LCD	14" LCD
Price	\$977	\$2,077	\$1,627

#### Apple System

	Desktop	Consumer Laptop	Professional Laptop
	iMac	iBook	PowerBook G4
Operating System	Mac X 10.2 & OS 9	Mac X 10.2 & OS 9	Mac X 10.2 & OS 9
Processor	700 MHz PowerPC G4	600 MHz PowerPC G3	1.0 GHz PowerPC G4
Memory	256M RAM	256M RAM	512M RAM
Hard Drive	60G	40G	30G
CD-ROM	DVD-ROM/CD-RW	DVD-ROM/CD-RW	DVD-ROM/CD-RW
Video Card	32M 2D/3D graphics accelerator	32M 2D/3D graphics accelerator	64M 2D/3D graphics accelerator
Sound	built-in audio	built-in audio	built-in audio
Modem	56K	56K	56K
Network Adapter	10/100 Base-T Ethernet	10/100 Base-T Ethernet	10/100 Base-T Ethernet
Monitor	15" LCD	12.1" LCD	15.2" LCD
Price	\$1,699	\$1,439	\$2,999

power, the desktop system will cost several hundred dollars less than the laptop system (Table 3).

## Where to Buy

In today's marketplace, you basically have two choices of where to buy a computer—directly through a mail-order vendor or from a local retail store. While many systems, such as Dell, are only available from mail-order sources, several large and reliable manufacturers, such as Hewlett-Packard and Compaq, make computers available at retail outlets.

## Mail Order

Most mail-order sources are reliable, but as is the case with any retailer, you must consider the possibility that not everything will work right out of the box. Companies like Dell and Gateway have a good reputation for delivering what they promise, when they promise it.

One major trade-off with purchasing from a mail-order company is the lack of face-to-face assistance offered by re-

tailers should something go wrong. You do, however, typically have free telephone support. In addition, most mail-order companies offer one year of free on-site service as part of any warranty. These two options should cover the majority of problems—at least for the first year. After that, should something go wrong, chances are you will have to ship the computer back to the manufacturer for any repairs.

For those looking for repair service coverage for a longer period of time, many larger mail-order companies have signed third-party agreements to provide continuing maintenance. However, these service contracts can be quite expensive and are not worth the additional cost to you beyond three years.

Mail-order manufacturers generally build their systems to buyer specifications. As a result, you are more apt to find the exact system you are looking for through a mail-order house. In addition, due to inventory practices, mail-order companies also tend to bring new technologies to consumers in a more timely manner than retail companies.

## Retail

Buying from a retail store doesn't necessarily mean that you will be paying much more. Popular stores such as CompUSA, BestBuy, and Circuit City are very price-competitive with on-line and catalog vendors. On the other hand, once you have purchased the system, it may be difficult to get a retailer to offer free consultation and technical support.

When you go to a retail store, you are typically confronted with several computers of various configurations. While it may be possible to find a system that offers almost everything you are looking for, be prepared to alter your wants to fit the systems available.

## Putting It All Together

Individual computing needs are just that and will vary from person to person. The type of system you buy depends largely on what you need and what you can afford. Consider both the current and intended uses of the system. Check the vendor's reputation for reliability, service, and support.

Table 4 indicates the recommended specifications for buying a computer today.

Given the rapid changes in technology, the only certainty is that what is top-of-the-line this year will be relegated to mid-line by the next. Some readers and users have voiced their concern that the systems discussed here are too advanced for their needs. Our goal has been to recommend systems that will provide sufficient computing power for the next few years and, perhaps, beyond. The ultimate purchasing decision, however, is yours to make.

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**Table 4.**  
**Recommended System**

	Wintel	Mac	Notes
<b>Operating System</b>	Windows XP	Mac OS X Version10.2	Windows XP Home good enough for most users
<b>Processor</b>	1.7 GHz Celeron, Pentium 4, Athlon, Duron	700MHz PowerPC G3 or G4	These processors should serve most users' needs for a number of years
<b>Memory</b>	256M RAM	256M RAM	You can never have enough RAM; better to pay up for more RAM than a faster processor
<b>Hard Drive</b>	40G	40G	40G is more than enough for most users, however, upgrade if you plan on working with video files
<b>CD-ROM</b>	CD-RW	CD-RW	Consider writable DVD if you plan on working with video files
<b>Video Card</b>	32M 2D/3D graphics accelerator	32M 2D/3D graphics accelerator	Video that is built into the system is fine for all but serious gamers and video producers
<b>Sound Card</b>	built-in audio	built-in audio	Built-in audio is fine for most users
<b>Modem</b>	56K	56K	These are generally built-in
<b>Digital Connection</b>	USB 2.0	FireWire	Consider FireWire if you plan on working with video equipment and some MP3 players
<b>Network Adapter</b>	10/100BASE-T Ethernet	10/100BASE-T Ethernet	Helpful for networking and high-speed Internet
<b>Monitor</b>	17" CRT or 15" LCD	17" CRT or 15" LCD	Bigger is better as long as you have the space
<b>Price</b>	\$600 – \$1,200	\$1,090 – \$1,499	