



Empire State Projects

Computer
Buyer's
Guide



A guide for the computer shopper...

Regardless of prior knowledge
of computers!

Table of contents

Introduction	3
What is a computer?	3
The basics of computer components	4
I/O devices	4
Keyboard	4
Mouse or Trackball	5
Joystick	6
Floppy Disk Drives	6
Hard Disk Drives	7
Video cards and displays	10
Other peripherals	12
Ports	12
Information processor	13
Housing or case	15

What is a compatible computer?	17
What is in a name?	17
Let's go shopping. Watch out!!	18
Appendix A - Memory	20
Credentials	21
Credits	22

Computer Buyer's Guide

Written by Jonathan J. Brennan and J. Samuel Wojtczak for Empire State Projects

Shopping for a computer can be frustrating if you don't know what you are looking for. Even the most experienced computer-literate person is unlikely to know all the terminology and types of equipment available. This document is intended to guide the novice or experienced user through some of the basics of computer purchasing. We encourage you to utilize other sources (magazines, articles, and professionals) in conjunction with this guide in your search for a computer. The more you know, the better you will be able to make an intelligent decision by finding an affordable, high quality computer system.

What is a Computer ???

A computer is a conglomeration of several basic component parts that function together to modify information or data, into a more useable form. Although there are many "accessories" a computer requires, there are only three basic components:

[1] Input/Output (I/O) devices: This device is used in conjunction with a computer to enhance, extend, or modify the functions of your computer through the use of either or both input and output communications. Examples are printers, disk and hard drives, monitors, keyboards, mice, joysticks, modems, and CD-ROM players. In today's industry, this list grows daily!

[2] Information processor: An information processor is the "heart" of a computer. This is the part of the computer that manipulates information and produces the modified information. These can come in various speeds and qualities.

[3] Housing or case: This is the actual container for the information processor and any internal I/O devices. Although not as important as the previous items, it can restrict or enhance the ability to "upgrade" or improve your computer in the future. The housing also provides the "visual presentation" for your computer.

The basics of computer components

This section is an organized breakdown of the most common computer components as well as things to look for and to avoid while shopping for a computer system. It includes descriptions of some of the most popular and necessary I/O devices, the information processor, and the case.

[1] I/O Devices:

1) The keyboard: A keyboard is a basic device that allows a computer user to provide information and instructions to a computer. Although very "basic" in design and function, there are several things to look for in a keyboard.

a) Compatibility: Will the keyboard work with your system? You wouldn't think there was a difference, but unfortunately there is. There are three basic types of keyboards: XT, AT, and PS/2. The XT type will only work with 8088 processor based machines (The older, original PCs and XTs). AT and PS/2 type keyboards work with all of the newer 286/386/486 types of processors. The only real difference between the two is the type of plug on the end of the keyboard cable. AT types have a large round 5 pin

plug, whereas the PS/2 types have a small round 6 pin plug. This isn't a functional difference but a compatibility difference. Just make sure that the keyboard you buy matches the plug on the back of your computer.

b) Keys - types and number: A good place to start is with a 101 key keyboard. This is a keyboard with all of the basics, like separate numerical keypad, separate arrow keys, 12 function keys, a basic typewriter style alphabet, and built in lights for Num Lock, Caps Lock and Scroll Lock. Although there are keyboards available with more "features", most of these are not useful to the average user and can cost quite a bit more. Try to avoid "gimmicky features", as these usually cause more trouble to set up than they are worth.

c) Keyboard feel: A keyboard should have keys that give the user feedback about whether a key has been pressed. Both soft click and hard click keyboards let the user "feel" when a key has been pressed, making your input much faster. The only real way to check out the "feel" of a keyboard is to try it yourself and see if you like it. A soft click keyboard is often less annoying in a home or office environment than a hard click keyboard because they generate less noise when keys are pressed. A keyboard should also have some kind of non-skid feet on the bottom to prevent movement of the keyboard while typing. Try to avoid mini or compact keyboard designs. The savings in space is often at the sacrifice of comfort. Finally, look for features such as tilt arms in the rear to slant the keyboard in a more comfortable position.

2) The Mouse or Trackball: A mouse and trackball are pointing input devices with one or more buttons that are used in various software applications for selecting options or choices. The mouse is a small hand held device that directs a pointer on the screen by moving the mouse on a desktop. A trackball is a stationary device that moves a pointer on the screen by spinning a ball on top of the unit. Each has its own distinct advantages. A mouse is generally easier to use, but a trackball requires less desktop space. A pointing device can make many applications (Such as Microsoft Windows) much easier to use.

a) Compatibility: A pointing device should always be 100% Microsoft compatible. Microsoft created

the industry standard in pointing devices and a pointing device without this feature is useless in many applications.

b) Interface: A pointing device can be connected to a computer through a serial, parallel, mouse, or bus port. When buying a mouse or trackball, make sure that you have an extra port of the type needed.

c) Number of buttons: A pointing device can come with one or more buttons which are used to select the item that the device is pointing to. You should make sure that the device has at least two buttons, since many programs utilize each button in a different fashion. A three button device is more flexible than a two button unit, and usually no more expensive. Try to avoid one button pointing devices, many programs can't be fully controlled with a single button.

d) Feel: A mouse or trackball should be molded to fit the hand comfortably, and buttons should audibly click to acknowledge a users choice.

e) Mouse Pad: Although not really a part of the mouse itself, a pad can be a great help in its use. A mouse pad provides a uniform, non-skid surface for the mouse to roll on so that there is more control. A near must for heavy Windows and paint program users, a mouse pad can also greatly extend the life of your mouse by keeping dust and dirt at a minimum. Since a trackball is encased within a "box", there is no need for a pad of any type.

f) Resolution: The resolution of a mouse or trackball is the smallest movement possible with the unit that will register on the screen, usually measured in dots per inch (DPI). The greater the number, the better, although all but the cheapest pointing devices have an acceptable resolution. Look for a device with at least a 120 DPI resolution.

g) Software and manual: A pointing device should come with installation software which you will need in order to use it. Many also come with extra software, usually for configuring programs for a pointing device that was not originally equipped for use with a mouse or trackball. Extra software is always nice, but don't be caught buying a pointing device just because of the software that comes with it. You will usually end up paying more to get the free bonus item and later discover it is something you can't even use. The manual should cover at least the basics of installation, cleaning, and maintenance of your pointing device.

3) A Joystick: A joystick is a hand held device with a moveable stick (usually used to indicate direction) and one or more buttons. These are very similar to the joysticks used in arcade style games.

a) Compatibility and Interface: There is usually little problem with compatibility (as long as you buy an IBM compatible type). However, joysticks do require a "game port" to be present on your computer. A game port is a 15 pin port similar in appearance to a printer or parallel port. The joystick plugs directly into this port and can be used without any additional installation in most cases. Most game ports can be equipped to control up to 2 joysticks each, with the use of a "splitter". Therefore, if you have a need for two joysticks you usually only need one game port and a splitter.

b) Buttons: A joystick can come equipped with one or more buttons. Most software requires two buttons, so avoid buying the one button version. Joysticks with "extra" buttons do the same thing as the required buttons but are placed in different locations so that the user may use the buttons that are most convenient. Try to get a joystick with at least two buttons since they're no more expensive and are more flexible than a single button joystick.

c) Directional Movement: A joystick can come with four directions (Up, Down, Left, Right) of movement or eight (the previous four and the diagonal path between each, ie. Up and Left). Although most new joysticks are eight directional, be sure to ask. A four directional joystick can be very limiting.

d) Centering: Most joysticks automatically "center" themselves, and this is good for most applications. In some programs, however, it is advantageous to be able to "turn off" the centering on the joystick for horizontal, vertical, or both types of movement (usually used with a flight simulator). Try to buy a joystick that makes this possible for each type of movement.

e) Appearance and feel: Joysticks vary greatly in appearance, from rather bland to an advanced galactic starship controller! The appearance you choose is strictly based on your own taste, just make sure it feels good in your hand and the buttons are easily accessible so that you'll enjoy using it.

4) Floppy Disk Drives: Disk drives are used to store information for a computer. This information can be in the form of a program or data. There are two basic types of floppy disk drives, 5.25" and 3.5". Each are named for the size of the floppy disks they can use. Each type of floppy is removable, that is a different disk with different information can be placed in the drive when needed.

a) More storage is better: The more information a floppy drive can store, the better. The actual physical size of the drive is irrelevant since 3.5" floppies are capable of storing more information than 5.25" floppies. Remember, it takes a more sophisticated level of technology to produce a smaller item that can perform as well as a larger one. In general, when dealing with computer oriented technology, the more "compact" the item is, the newer and usually more dependable it is.

b) Speed: Floppy drives are not very quick when accessing information. If you are looking for fast access times get a good hard drive (discussed in the following section).

c) Fragility: Because floppy disks are removeable, they are much more susceptible to damage than a hard drive. 3.5" disks are usually more dependable than 5.25" disks because they have a hard plastic protective cover, but don't feel that they are invulnerable. When storing information on a floppy ALWAYS make an extra or backup copy on another disk so that if one disk gets corrupted, all of your valuable work is not lost.

d) 5.25" or 3.5": If at all possible, get one of each type of drive (5.25" and 3.5") installed in your computer. This will save you time and aggravation when you purchase a program that is only supplied on one size of diskette.

e) High Density VS Low Density: A high density disk can store two or more times as much information as a low density, also referred to as double density. The difference in cost between a high and low density drive is usually minimal, so try to get a high density drive since they can read and write on both types of diskettes.

f) Half Height VS Full Height: This is simply the physical height of the drive itself. A half height drive takes up only half the space needed by a full height drive in your computer case. Full Height drives are also usually older, so try sticking with a half height drive.

g) The Controller: Floppy drives require an internal "controller card" to make use of them in your system. When purchasing a system this card is usually included, but if you are assembling your own system do not forget to purchase a floppy controller card and the connecting cables (sometimes combined with the hard drive controller).

Note: There are several drives that have been or will be released soon that will allow greater storage on a floppy based medium, the newest being a 2.88Mb 3.5" drive. Be on the look out for these new types of drives !

5) Hard disk drives (hard drives): A hard drive is a non removable disk drive. Located internally or externally, it serves as a medium for storing and processing data without the need for the swapping of many floppy disks. To best describe how to shop for the right hard drive for your new or old computer system, you need to educate yourself on the following things (for a more detailed description of hard drives, refer to the July 1991 issue of Computer Shopper, page 429, for an informative article on the subject):

a) Physical Size: A hard drive's physical size is classified using height and width (depth varies). The height can be either half or full and the width can be either 5.25" or 3.5". A half height drive gives you greater flexibility later on in that you will be able to fit two half height drives in the same spot you would normally put a full height, in most cases. Gain even more flexibility with a 3.5" type width drive over a 5.25" because most 3.5" drives come with a bracket that allows you to fit the drive in a 5.25" slot inside your case if you so wish, instead of putting it in a 3.5" slot. You don't have this flexibility with a 5.25" type width drive. And remember, in most cases the smaller - the better. Most people feel safe with a 20 lb. full height drive, just because it's big and heavy. You are actually better off with a smaller physical size drive! The reason for this is that in order to miniaturize the drive, the most recent and best technology has to go into the manufacturing of the drive. On that note, bigger drives tend to incorporate older technology.

b) Storage Capacity: A drive's storage capacity is usually denoted in Mb, or megabytes, sometimes pronounced meg. A single Mb is the equivalent of 1024K (or bytes). (This terminology is exactly the same when dealing with memory and floppy disks as well!) One thing

to remember is that most hard drives advertise the maximum or average number of Mb for that drive. This does not mean you will get that exact amount of storage from the drive. Check with the manufacturer, or vendor, to find the exact storage capacity you can get out of the drive you're interested in. Be prepared to answer certain questions about the computer and controller you have or are thinking of buying (see next section on controllers).

c) Controllers: This is probably a more important item to consider than the drive itself, at least initially, since it literally controls your hard drive and is the "middle man" between your hard drive and your computer. A controller is basically a translator. It can control one or more hard drives (of its type) and/or floppy drives.

Overall, there are four main types of controllers: ST-506, ESDI, SCSI, and the newest IDE.

1) The **ST-506** was the first controller type for computers. The way information is coded f10 or this type varies between **MFM** (Modified Frequency Modulation), **RLL** (Run-Length-Limited), and **ARLL** (Advanced RLL). Make sure the hard drive you purchase not only matches the ST-506 type, if that is your decision, but uses the coding scheme (MFM, RLL, ARLL) you want to go with. On a given disk, ARLL increases storage by 100 percent and RLL by 50 percent in comparison with MFM.

2) The **ESDI** (Enhanced Standard Device Interface) controller is a better version of the ST-506 standard. It was developed to gain better overall performance out of the same basic format. Be careful in choosing a controller to match your ESDI type drive. Make sure your maximum speed ratings for both the drive and controller match.

3) The **SCSI** (Small Computer System Interface) controller is a system-level interface (unlike the ST-506 and ESDI which are direct-level). The advantages of using a system-level interface is that they are more intelligent and independent than their direct-level counterparts. They make the drive/controller system a separate entity since the computer does not have to control them. SCSI allows the connection of other peripherals, like scanners, which use the SCSI type interface. Presently this

type is plagued with problems in compatibility, both on the SCSI to SCSI peripheral connection and the SCSI to computer connection. Beware if you decide on this interface. It has shown itself to have great possibilities due to its speed (about four times faster than the ST-506) and universal peripheral connections, but if possible you should wait for the "bugs" to get worked out.

4) Finally, the **IDE** (Integrated Drive Electronics) controller is the newest standard on the market. It can reach access times as fast as your computer system will allow it. Theoretically it can reach speeds three times that of the SCSI interface, which is about four times faster than the ST-506 type. It is one of the easiest to configure of all the types since most of the needed technology is actually built onto the hard drive itself. It also tends to be the most inexpensive for its speed. Be careful if you have an old IDE type drive and controller. Due to the new standard for IDE, check with the manufacturer or vendor to see if the new drive you buy will be compatible with the old IDE drive and controller.

d) Cache and Speed: The access time for a hard drive is often a big consideration for most shoppers. Although speed is important, it is also limited by your computer. If you spend more money on a faster drive for a machine that cannot take advantage of it, you are just wasting money, unless you knowingly buy it to use the drive in an upgraded computer later on. As a general rule of thumb, a 286 computer should have a drive with an access time of at least 40ms (milliseconds), a 386 computer with at least a 28ms drive, and a 486 with at least a 18ms drive. The faster the access time, the more money you will spend, therefore choose according to your budget as well as the recommended speeds.

Another consideration is caching. A cache is a form of memory that speeds up the device it is connected to. In this case, the hard drive. Caching can dramatically increase speed because memory is much faster than a drive, but the issue of more money comes into play again. Finally, be careful in your selection by remembering that speed is related to the interface, your computer, and your hard drive, especially since the computers and hard drives today cannot take full

advantage of the controller's potential speeds.

e) Parameters: The parameters of a hard drive include, but are not limited to, items like the number of cylinders, heads, and sectors per track. Although these items are not always advertised, it is a good idea to find them out before purchasing a drive. The main reason for this is DOS, as well as other things, restrict the number of cylinders it can understand. It is recommended that you find a hard drive that has 1024 cylinders at the most. If you go with a larger number of cylinders you will need special drivers in order to utilize the entire capacity of the drive, which may present problems down the road in compatibility. Another option, if you have, or buy, a drive with more than 1024 cylinders, is to define the drive as only having 1024 cylinders. Although a viable solution, it will not, unfortunately, allow you to take full advantage of your hard drive's capacity.

Note: By using this information and other sources, such as the article on page 429 in the July 1991 issue of Computer Shopper, you can select the right drive and controller for your computer. Before shopping, decide on a controller type (maybe you already have one in your machine or lying around the house), the capacity you will need, the money you want to spend, and the speed you want (remembering the restrictions of the drive and computer). Keep in mind that all these items are inter-related and that in order to save money you may have to sacrifice one or more of these considerations, such as speed, capacity, and/or type.

6) Video Cards & Displays: Your screen is one of the most important computer features. It controls how your computer communicates information to you and can greatly limit the ability to use various programs. Resolution plays an important part in describing a video card and display. It is defined as the number of dots, or pixels, horizontally by vertically (ie. 1024 x 768).

a) Monochrome Adaptor & Screen: Monochrome display cards come in two different configurations, text only and graphics compatible. The text only type is nearly useless for most applications today. Do not buy this type. For only a few more dollars you can buy an adaptor that allows graphics. The graphics capable card is limited to a two color (foreground/background) display with resolutions up to 720x350. This setup is very

inexpensive, but can be extremely undesirable and frustrating after a short period of time.

b) CGA: The CGA type screen is really no better or worse than the Monochrome type and at the same time much more expensive. CGA is graphics compatible and usually allows for two basic types of setups, a 640x200 resolution with two colors (black and white) and 320x200 with four colors. These displays are more attractive in appearance than a monochrome screen, but are just as limiting.

c) EGA: The EGA setup is a step above the CGA and Monochrome types. This allows better resolution than the CGA with 640x480, and can display 16 distinctly different colors at once. Although better, they can also be expensive. If you are going to spend this kind of money it may be advisable to purchase a VGA.

d) VGA: A VGA setup can display up to 256 different colors at once from a virtually unlimited palette of colors. The resolution of a VGA monitor is dependant on the type you buy: Standard VGA is 320x240 and requires a video adaptor with 256K of memory and nearly any VGA screen. Enhanced VGA has a resolution of 640x480, requiring a video adaptor with 512K and a VGA screen capable of at least this resolution. Super VGA, SVGA, has a resolution of 1024x768 and requires a video card with 1 meg (1024K) of memory and a SVGA screen with at least this resolution.

A VGA setup is by far the best. With the Enhanced and SVGA you can achieve near-picture perfect quality displays, but VGA can also be the most expensive.

When purchasing your VGA video card make sure to get a 16 bit, since these are much faster than the 8 bit card and usually don't cost much more. Also, keep in mind that with video displays, analog is always better than digital. Ask when you are purchasing your system.

VGA screens are also available in a "paper white" or grey scale version. These screens provide an excellent inexpensive avenue to obtain VGA quality at a substantially reduced cost. Instead of displaying 256 colors, these screens interpret the colors into greys, much like a black and white photograph. Do not confuse these screens with monochrome monitors, they are superior in quality as well as resolution. Paper White VGA screens also have an advant13

age over color VGA screens. They're much easier on the eyes and cause less strain. These are excellent for use in an office environment and, because they use the same video cards as a color VGA, do not require a change in the video card if you would ever upgrade to a color monitor.

e) Screen Size: The size of a display is advertised the same way as televisions, the distance diagonally across the screen. Make sure to get at least a 12" monitor. These are reasonably large and do not cause extensive eye strain. A 14" monitor is usually as large as a "normal" user will ever need and may not be much more than a 12".

Note: Many VGA cards are configurable to function as a Monochrome, CGA, and EGA so that screen dependent programs can still be used with a VGA monitor. Also, when buying a VGA card try to get a card that allows its memory to be increased up to 1 meg without replacing the card. This will save you money in the future.

7) Other Peripherals: Peripheral is a fancy term for just about anything you can hook to your computer, such as a printer or CD-ROM player. Peripherals are items that enhance whatever you need or want to do on your computer. Say you are a musician and use the computer for recording, editing, and enhancing production. You may need a Midi interface. Or let's say you are a publisher or editor and need to access the dictionary and encyclopedia constantly. You may have a need for a CD-ROM player with CDs holding the entire encyclopedia and dictionary.

These are all examples of peripherals, each different and specific to their use. Because of the huge amount of peripherals out there, we cannot spend the time we would like on each and every one. If you have a need for a peripheral that is not covered within this document, consult friends, professional magazines, and manufacturers about what you need. Learn everything you can about the product before you come to a decision.

8) Ports: A port is the actual interface between your peripheral and the computer. Although it is not an I/O device as described in the above scenarios, it is the I/O interface. An I/O device can't function without connecting it to a port. There are two basic types of ports, device specific and general. A device that requires a specific interface, such as a hard drive, needs a

device specific port. A general port, like a parallel or serial port, is used by a device that doesn't require special technology on the port, but instead puts needed technology on the device itself.

The basics of ports are simple. Specific ports are for those products they came with only and therefore cannot be used with anything else (unless otherwise stipulated by the manufacturer). Examples of general ports would be the parallel and serial ports. These are described according to the way they function. A parallel port communicates synchronously, or multiple bits at once, whereas a serial port communicates asynchronously, or one bit at a time. A parallel port is sometimes referred to as a printer port. Although most printers can use either a parallel or serial port, it is a good idea to stick with parallel since it is a faster medium, especially when dealing with large amounts of data, like printing out a complicated and detailed graphic. Serial is also referred to as a modem port due to the fact that most modems use this type of interface. Remember that all ports can come in a variety of sizes and connection schemes. Check with the devices you are purchasing to be sure they will match up with the ports you have available, or need to purchase.

Before purchasing a computer, make sure it comes with a variety of these ports, or at least one parallel and one serial port. You can always add more ports later as needed and at a reasonable price. The ports are relatively inexpensive, usually under fifty dollars for a few ports all on one card, or adapter!

[2] Information Processor:

An information processor on a computer is better known as a combination of a mainboard, or motherboard, with a CPU, BIOS, and memory. This is the "brain" of the computer, necessary for all operations since it processes all data and information between all the devices connected to your computer, from floppy and hard disk drives to the monitor.

a) Mainboard: The mainboard is basically a circuit board with chips scattered in a deliberate manner. These chips vary in function from the actual processor, or CPU (Central Processing Unit), to the BIOS (Basic Input Output System). The board for the most part is generic. It houses the important parts whose descriptions follow.

b) Chipset: Manufacturers and vendors use this terminology to better describe the mainboard. Examples of chipsets are VLSI, C & T, ETEQ, and Intel. This basically tells you who is the primary manufacturer of the chips on the motherboard. The actual chips produced by these different companies vary in function and design, especially in relation to the make and model of the computer. The chipset can give you a good idea of whether or not the computer will be a totally compatible system, although there are other items that derive compatibility. Do some heavy research to find a good chipset. C & T's chipset usually comes with high user and manufacturer recommendations, mainly due to its' overall quality, proven compatibility, versatility, and price.

c) CPU: The Central Processing Unit is the actual "brain", or control center of the computer and probably the most important facet of your computer. Most of us are familiar with the CPUs produced by Intel, the biggest manufacturer of micro-computer chips. Another fine company in this field is AMD (American Micro Devices), Intel's only major competitor and the designer and only manufacturer of the 386 40Mhz CPU. Both manufacturers come with high recommendations. Look for great things from both companies in the near future due to their relatively new rivalry!

d) The bus: The bus is comprised of expansion slots (usually eight) that house interface cards for various devices, like a hard drive controller. It controls the flow of data between these slots and their devices with other slots and their devices as well as the rest of the computer. A bus is measured by the number of bits it has. Generally the more bits a bus has, the faster it is.

Expansion slots are measured in much the same way. They vary in "size" between 8-bit, 16-bit, and 32-bit. Look for a mainboard with a combination of all these sizes but with a larger number of 16-bit slots (most utilized size today). In lower end machines, such as the 286 and 386SXs, you will not find a 32-bit expansion slot since this slot is larger than the bus. Generally, an expansion slot could operate with a slot larger than the bus size, but this is usually not implemented since the bus can't take full advantage of its' size and therefore its' speed. Higher end machines should be equipped with at least one 32-bit expansion slot. Most machines only have one since there isn't a lot of cards on the market today that can take full advantage of its' size.

Cards, or adapters, are the boards that run the devices in and hooked to your computer. They plug into the slots and process information to be sent other places in the computer. Most cards today either come only in 16-bit or both 8 and 16-bit. It would be more advantageous to buy a larger sized card

because they operate faster, but at the same time they can cost more money. As a sidenote, most 8-bit cards can be plugged into and operate in a 16-bit slot, although speed does not increase. Check with the manufacturer of the computer and card to see if there are any limitations.

e)

Memory: A computer would be useless without memory. Memory comes in a variety of forms and formats, such as RAM (Random Access Memory). RAM is used by software as a place for temporary storage of information waiting to be processed or used. It would then be logical to assume that the more RAM you had, the better your computer could process information, therefore being faster. Unfortunately this is not the case. The amount of RAM you can actually utilize greatly depends on your software. To know just how much RAM you may need or can even use, refer to appendix A.

After you know how much RAM you want, one major concern should be speed, measured in ns (nanoseconds). Look for a speed that matches, or faster, than that required of the computer you are looking into buying. A major reason for this is that it decreases your wait time (called wait states) to zero. Ask the manufacturer or vendor for assistance in appropriate memory speed.

RAM comes in a number of designs, shapes, and sizes. Most older style mainboards use memory chips for a limited amount of conventional memory (see Appendix A for definition). Others use SIPPs or SIMMs, which are a varying number of chips on a little board which plug into a special slot on the mainboard. Both are exactly the same with one minor exception. SIPPs have pins on the bottom whereas SIMMs have a special plated connector, similar to that of expansion cards, or adapters. Capacity, configuration, and physical size range greatly between these different types of RAM. Ask the manufacturer or vendor for assistance.

One thing to remember when shopping is to find a mainboard that has a relatively large maximum amount of RAM that can be plugged directly into the mainboard. Memory plugged into the mainboard is significantly quicker than that of any other type (memory expansion cards and the like). Most 286's accept at least 4Mb (meg or megabyte), 386SXs and 386DXs 8 to 16Mb, and 486SXs and 486s 32Mb. For most average applications, 4Mb is more than enough. See Appendix A for a more in depth description of memory and how to decide what's best for you.

Caching is a final form of memory, different from

RAM. It enhances the processing speed of your computer greatly. Look for this option on all 486s and most 386s, with the exception of the SX models.

f) BIOS: The BIOS, or Basic Input Output System, is the actual programming of your computer. It dictates what your computer can and cannot do as far as mainboard and video functions. Choosing a good mainboard BIOS is as important as choosing a chipset, because it also represents the amount of compatibility that your computer system will have. Besides compatibility, look for a BIOS that can put itself into memory upon starting the machine (booting). By putting the BIOS into memory, the computer's overall speed will increase because mainboard memory is quicker than the BIOS chips. Other things to look for in a BIOS is available functions and versatility. For example, some BIOS manufacturers include extensive mainboard function, memory, and BIOS testing upon booting the computer. Others even include built-in diagnostics. Ask your manufacturer for specifics on their BIOS. Some may have their own or use another company's BIOS, such as AMI or Pheonix.

[3] Housing or case:

The computer that you buy will be in a container called a case. The case is used to protect, power, and allow expansion for your computer. The case also provides a visual presentation for your computer, and is an often over-looked integral part of a system.

a) Power Supply: Most cases come with a built in power supply. This converts the AC power supplied from a wall plate into DC power used by computers. A power supply is extremely important because it can limit the computer's expansion capabilities (accessories that can be safely added to your system). A good power supply is usually about 200 Watts which is usually enough to power a CPU (or motherboard), two floppy disk drives, two hard drives, and a monitor without much difficulty. Of these, the motherboard, floppy drives, and hard drives are the primary consumers of power in most systems. Some video displays also use the power supply as their source of energy. If you are using this type of monitor it can draw up to 70 Watts of additional power. Make sure that your power source will be sufficient for the configuration you have chosen. An insufficient power supply has been the demise of many computers.

b) Cooling: A power supply also serves as a cooling unit for your computer. Most power supplies have a built in fan that draws in cool air. Most fans are sufficient for this cause, but try to purchase a quiet fan since noisy fans can be highly aggravating.

c) Size: Many of the newest computers come in a very small desktop case. These are often advertised as "baby or mini" style desktop cases. The reason for this is to make the computer less cluttered. Often these cases are more of a disadvantage than they are worth. The small size of the case often limits the ability of the case to accept accessories. The cases often allow only one or two expansion cards to be added, and only one or two of the smaller 3.5" drives. A small case can also limit the cooling ability. If you want to have a case with a small footprint, and none of the disadvantages of an ultra small case you may be interested in a tower style design.

A mini tower case is usually equipped with the ability to handle 5 drives, 8 expansion cards, and are designed vertically to allow thermal flow cooling (usually better than a horizontal design). Many people also find the cases more attractive. Another advantage is that these cases are relatively small and can be put on a desktop or floor.

If the capabilities of a mini tower do not suit your needs, you may also be interested in a mid size or large tower. These units can be conveniently placed on a desktop or floor. A larger horizontal case is another possibility, but these do not cool as well and take up a large amount of desk space. Before buying a case, make sure that it will meet your needs for the next couple of years. Can you expand? Can you upgrade the type of computer in the case? Is it attractive? How much space will it take up?

d) Function Controls: Most every case comes with an on/off switch, but there are several other options available. When looking for a case try to find one with these basic features:

Reset Button: This allows the user to restart the computer without turning it off and then on.

Turbo Switch: This allows the user to instantaneously alter the processing speed of the computer to more correctly match the software currently in use. Usually used to slow down entertainment software.

Keylock: This allows the user to turn off the keyboard to eliminate unauthorized access to the computer.

LEDs: Usually for the power, hard drive, and turbo switch, these allow the user to easily see the current status of the computer.

Digital Display: This gives a readout of the current or supposed speed of the computer, usually inaccurate. It is highly unnecessary, but can enhance the case's appearance visually.

Be advised that these options, and others, can only be used on a mainboard that can process them. Check with your manufacturer.

What is a compatible computer?

Many times we see machines advertised in the paper and magazines as being 100% compatible or 100% IBM compatible. This means that the machine advertised has an ISA bus, or the Industry Standard Architecture. An architecture defines the way a machine "communicates" with the items connected to its mainboard expansion slots, the actual "bus". There is really no such thing as an IBM compatible, because IBM has two types of systems they sell, either with the MCA (Micro-Channel Architecture) or the ISA. So if an ad says compatible or IBM compatible, it actually means it has an ISA architecture.

If a system is advertised without stating its compatibility, chances are that it's not compatible. Check with the company selling the computer. Also, if a company advertises that it has a compatible machine, it does not necessarily mean it is truly compatible. Check with the company to see if the computer will support standard, popular software products and operating systems, such as networking software like Novell and operating systems like OS/2, UNIX, and MS-DOS. Also check the make of the BIOS and chipset. These can effect compatibility as well.

By finding a truly c20

compatible ISA computer, you are assured of no problems with standard hardware and software for years to come as well as upgrading your machine later on down the road! Just to be safe, make sure it comes with a money back guarantee of at least two weeks so you can check it out for yourself.

What is in a name?!?

You'll be surprised to find out that there is absolutely nothing associated with a name brand product other than the name itself. Many name brand companies are making their livelihood by living off their name. Not only in the computer industry, but any industry, people buy something just because it has a name they have heard of. It's usually a very safe bet to go with a name brand company, but it doesn't mean you're necessarily getting a better product. And in almost all cases, you are not going to get a better deal as far as price, quality, and service.

As a consumer, you are better off learning all you can about the product you want to buy, then shop for prices, quality, service, and warranty/guarantee. Often generic (no name brand) companies can sell you the same thing you can get from a name brand company for significantly less, with more, better built, and a better overall service agreement.

You can save major amounts of money, especially in the computer industry, by being an educated buyer! If you could save five hundred dollars for five hours work of researching and calling different vendors and manufacturers, the Better Business Bureau, and asking people you know in the industry questions, would it be worth it? Of course, because in essence you made 100 dollars an hour and most likely got more for your hard earned dollars!

Let's go shopping. Watch out!!

With anything you buy, there are certain things you should look out for when going to shop for a computer. Avoid falling into the salesperson's grip. For instance, there is no such thing as "today is the last day"! If a salesperson wants your business bad enough, they will be more than happy to make you a comparable offer a week later! Of course demo items and the like could be sold by then, but don't ever rush into anything. Sit back and absorb all you can. This way, when **you** are ready, not the salesperson, and you feel confident in what you are buying, you'll be happier in the end. Why spend hundreds, or even thousands, of dollars on a spur of the moment decision. How often have you bought something and a week later saw , or heard from a friend, that the same thing was selling for less? Remember that feeling when someone tries to pressure you into a sale!

Another thing to watch out for are advertisements. Think of ads as mind games and that nothing in life is for free. Read between the lines and ask a lot of questions. In the computer industry, many companies break down their prices so that an advertised price includes the bare minimum. After you add in all the other options, the great deal in the ad is not so great! Make sure you get the price for what you are looking for (all the hardware, software and service). And always remember, nine times out of ten, a price does not include tax. Ask to have the tax added in as well. With a thousand dollar machine, tax can add up to be as much as eighty dollars or more!

Check for compatibility as stated in the preceding section "What is a compatible computer?" Also, if you have existing software and/or hardware, or you are thinking of buying a certain product or package, ask the company if they can demonstrate the product running on their machine, or at least guarantee it. The company may require a small fee to install the product as well as require the product from you to install, but once you have narrowed down the company you want to deal with, the time and/or money it takes to have that done will save you frustration and headaches later when something doesn't work right.

Magazines can be a great source for information as well as product evaluation. But don't let this be your only source. Many companies spend hundreds and thousands of dollars to advertise. Others may be required to pay or supply expensive equipment to be evaluated by a magazine. This

creates an unfair disadvantage for the companies who want to keep their prices down and competitive and chose not to take that root. Also, magazines are flat out wrong sometimes. After all, they're human too. Just because you read it in a magazine or article doesn't mean it's true! Check the facts yourself. Don't make a big money decision based on some article in one magazine. After all, you could be misinformed by a simple typo!

Parts are the essence of the computer. From the case to the motherboard. Learn what makes a computer tick and what you should look out for with every little part. See the preceding section on "What is a computer?" and research on your own.

How about the warranty? Many companies advertise having warranties. Check to see if the warranty is included in the price. You may be surprised at what you find out. Second, ask for the warranty in writing ahead of time. This way you can review it at your leisure and see if it covers all the things they say they do. Once you decide on a machine, make sure the receipt states the warranty period as well as any other "promises". That way you are assured some protection in the future if need be! Does the warranty include parts and labor charges for the whole period? Just parts? Just labor? Any other fringes such as pick-up and delivery (on-site) or the company pays shipping? Decide on a warranty you will be happy with. Obviously, the more you can get the better, especially if it's included in the price!

Can anyone service the computer you are thinking of buying? If not, can you ship the computer to the company at their expense? Will they come and pick it up, and how much will that cost? How much is their labor charge? Decide on a company that is willing to meet you half way, at least!

What about a money back guarantee? Is the guarantee all that it seems to be? Look for a guarantee of at least two weeks. This way you have sufficient time to test out the machine you bought thoroughly. Also, make sure what this guarantee covers. A guarantee won't cover things like changing your mind, but if you have a standard application that won't run on it (even if it is installed correctly) you can usually get a percentage of your money back as well as credit if you wish. Check with the company's policies. Just like with the warranty, get the guarantee in writing on the receipt as well as a copy you can look over thoroughly before you buy. Incidentally, many companies will charge you a restocking fee at their discretion at a specified percentage rate. This means you get a refund minus this restock fee. The reason for this charge is if the company doesn't feel it can sell the same computer right away or can't put it back in stock, they will be charged by their supplier(s) for returning it, usually at the same percentage penalty. It's not because they are trying to make money off of you even if you return it, although there may be companies out there like that. One never knows.

Be careful when shopping, and by all means have fun!! Don't be afraid to ask questions and if you go to a store, ask to speak to a technician who repairs the machines. They can tell you things like what models and parts tend to break down more often as well as explain anything about computers

you don't fully understand. After all, it's not an easy thing to shop for let alone know everything about them! Also remember this - nobody should treat you like you are stupid. You're NOT! If someone treats you in that fashion, don't deal with them, plain and simple! They are just trying to intimidate you! Remember that all of us started out knowing the same about computers, little to nothing. Just because someone knows more does not give them the right to intimidate anyone and talk to them as if they were inferior.. That person, or company, doesn't deserve you as a customer...you can do better! Good luck!

Appendix A

We all think of memory in computers as just memory that your computer uses to do things with, whether it is to run applications, spool printing, and so forth. But there is much more to it than you think. It is important to understand just how memory works, especially if you are about to buy a computer, application, or upgrade your current machine with more memory. You may be surprised to find out that the system, application, and/or memory you were looking to purchase won't do all that you thought it could do, or vice versa.

Memory in a microcomputer is made up of three different parts: conventional, upper memory block (UMB), and extended/expanded memory. As an example, let's say you have a computer with 512K of memory. This memory is all conventional. Another example is, let's say you have a computer with 1Mb (1024K). This computer has 640K of conventional memory and 384K in the UMB. As a final example, let's say you have a computer with 4Mb. This computer actually has 640K of conventional memory, 384K in the UMB, and 3Mb of extended and/or expanded memory. The chart below best illustrates the break down of these parts.

Conventional Memory	UMB	Extended/Expanded Memory	
	↓	↓	↓
0k	640k	1024k (1Mb)	???.Mb

Conventional

This memory is available on all microcomputers, just maybe not the entire 640K. It is made up of the first 640K of available memory. This area of memory is used by most applications and functions, like device drivers and TSRs.

Upper Memory Block (UMB)

This area, or block, constitutes 384K of memory above and beyond the first 640K of conventional memory. This space is reserved for the BIOS (Basic Input Output System - main and video), ROM (read only memory) chips, and any other hardware that can take advantage of this area, such as network cards. Some mainboards can take advantage of this area by putting the BIOS into this block, making your computer's overall speed quicker!! Check with your manufacturer or vendor. Certain applications may be able to take advantage of whatever space is left in this area, like Microsoft Windows 3.0 and MS-DOS 5.0. For instance, the new version of MS-DOS (5.0) can give you the ability to load device drivers and TSRs into this area of memory, freeing more of your conventional memory for application and function uses!! Some restrictions may apply.

Extended/Expanded Memory

Extended memory is the area of memory above the initial 1024K (1Mb). Extended memory, all, none, or some, can be made to look like expanded memory through the use of a memory manager (a device driver) or can be configured as such on some computers or memory expansion boards. To know whether or not your system needs either or both, check your applications. Some applications can only take advantage of one or the other, some neither, and some are more versatile and can handle both types.

Using this information and knowing what your computer hardware and software requires can save you aggravation, time, and money!!

Credentials

This document was prepared and written by Jonathan J. Brennan and J. Samuel Wojtczak for Empire State Projects. Our intent was to inform our audience with as much information about basic microcomputer concepts while being as brief as possible. The basic premise behind this is not strategy, but honesty. ESP believes that in order to appreciate the quality, service, and prices they offer, you must first become familiar with basic computer concepts and second shop the competition to see if you can truly find a computer that offers anything close to what ESP does. ESP is so confident in their product that they're even giving you the tools you need to obtain true comparison shopping. This is just another fine example of what ESP is willing to do for its patrons!

Jonathan J. Brennan has been associated with the computer industry for more than ten years, five of them professionally. He worked for the State University of New York at Buffalo for over three years doing research and development, technical support, and servicing. Afterwards, he was employed by Computerland of Upstate New York as a Sales Support Technician and later as a Project Manager. After leaving, he started Unlimited Computer Visions, Inc which provided

software and hardware consultation and support for rates unheard of in the industry. Due to a high demand from UCV customers for affordable, high quality computers, in 1991 Unlimited Computer Visions decided to merge with an up and coming mail order computer and art supply company called Empire State Projects, owned and operated by J. Samuel Wojtczak.

J. Samuel Wojtczak began his computer career as a programmer of graphics applications. After about two years he went on to manage and maintain a high school mainframe computer system. In mid 1989, he did consultation work for the State University of New York at Buffalo for over a year before starting Empire State Projects. His vision was to run and own a company that provided the lowest prices available for the product it was selling.

Both have four basic philosophies you will find entangled throughout the ESP organization today. The first to provide a service and/or product without pressured sales and with total honesty. Second is to have a low profit margin and sell more volume to obtain an acceptable profit in the end. Third, to stock only essential items to keep overhead low and at the same time provide speedy delivery. Finally fourth, to own all assets rather than lease to keep prices low.

If you have any questions about Empire State Projects, please feel free to contact the Better Business Bureau of Western New York.

**Empire State Projects
28 Eighteenth Street
Buffalo, New York 14213
(716) 883 - 6525
(800) 347 - 6525**

**1st Edition
July 1991
Empire State Projects**

Credits

This document was prepared and written by Jonathan J. Brennan and J. Samuel Wojtczak for Empire State Projects. The information contained within this document was written with intentions to inform individuals about micro computers and their components in an organized and detailed manner with

regard to being as brief and understandable as possible, without bias towards or against any individual, company, or organization. The authors apologize for any mistakes or typos and encourage readers to inform them of any such problems via Empire State Projects.

The information contained within this document is subject to change without notice. The authors and Empire State Projects (ESP), its affiliates, and employees, shall not be liable for error or misinformation contained within or for incidental consequential damages in connection with the furnishing, performance, or use of this material. This document was prepared with the best of the author's knowledge and resources, without prejudice.

All materials contained in this document is the property of Empire State Projects. The replication and/or duplication of said material is prohibited without the prior written consent of Empire State Projects, with the exception as outlined below. ESP encourages reader's to pass this material to others but only in its entirety (including this page). Other copies can be obtained by contacting Empire State Projects.

OS/2, MS-DOS, Windows are trademarks of Microsoft Corporation.

PC/XT/AT, PS/2, and OS/2 are trademarks of International Business Machines Corporation.

Novell is a trademark of Novell Inc.

UNIX is a trademark of AT&T.

AMI is a trademark of American Megatrends, Inc.

Phoenix is a trademark of Phoenix Technologies Ltd.

Other brand and product names are trademarks and/or registered trademarks of their respective companies.

**Empire State Projects
28 Eighteenth Street
Buffalo, N.Y. 14213
(716) 883 - 6525
(800) 347 - 6525**