BUYER'S GUIDE TO PURCHASING AN IBM-COMPATIBLE\textsuperscript{1} MICROCOMPUTER: QUESTIONS FOR DEALERS

Introduction

IBM-compatible computers are put together like custom bicycles. The components are made by various companies and assembled to order by the dealer or manufacturer. While standard configurations are offered, you can specify virtually any combination of components. Thus, it is a good idea to ask about each component before purchasing a machine. The following sections suggest a series of questions to ask of all dealers, and of mail order dealers specifically, in order to ensure that the components you get will meet your needs.

Questions for all dealers

1. What processor does the computer use?

Processors are, from best to worst: \textit{Pentium}\textsuperscript{TM}, 80486, 80386, 80286, and 8086 or 8088. Some processors are designed to run two, three, or even four times as fast internally. these chips are labeled 'DX2,' 'DX3,' or 'DX4.' Processors that can not work as quickly are labeled 'SX.' Intel, AMD, and Cyrix are big makers of CPU chips. The processor determines the class of machine.

IBM PC or XT compatibles use the 8086 or 8088. These computers will run 50 percent of the software out there, albeit slowly, but the technology is basically obsolete. Programs that require Microsoft Windows 3.1 will not run on this class of machine. Avoid if you can afford better.

IBM AT compatibles use the 80286 processor. These computers will run 75\% of the programs now available. These machines will run the Microsoft Windows operating environment, given enough memory and a large hard disk, however performance may be unacceptably slow. True multitasking operating systems will not run on this class of machine.

Machines using the 80386 processors are now available at very reasonable prices. All but a few software packages today come in a version that works with the 80386 processor. The 386 and above have a number of advantages beyond sheer speed; they also allow you to run very large programs, and to multitask, i.e., to run two or more programs simultaneously. However, you must run special software or operating systems such as OS/2, Windows 3.x, UNIX, or Desqview in order to accomplish these things. They are

\textsuperscript{1}Disclaimer: These questions apply only to IBM-compatible computers, not IBM PS/2, Apple, Commodore, or other machines. The advice contained in the notes after each question is necessarily general; it may not always apply.
the workhorses of the business community, and make a great entry-level student computer.

Machines using 80486 chips are the fastest processors that are available at a reasonable price. Most corporate buyers are now purchasing 80486 computers instead of the older 80386 machines.

Intel's Pentium™ chips are now available, but computers that use these chips are still expensive. To buy one would constitute over-kill for most students and faculty. PowerPC™ Processors that out-perform the Pentium™ for a lower price will soon be available from Motorola, Apple, and IBM.

2. How fast does the processor run?

Faster is better. The following table indicates the speeds you can expect for a given processor, measured in megahertz (MHz).

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<thead>
<tr>
<th>PROCESSOR</th>
<th>SPEEDS AVAILABLE</th>
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<tbody>
<tr>
<td>8088 or 8086</td>
<td>4.77-10 MHz</td>
</tr>
<tr>
<td>80286</td>
<td>8-20 MHz</td>
</tr>
<tr>
<td>80386</td>
<td>25-40 MHz</td>
</tr>
<tr>
<td>80486</td>
<td>25-100 MHz</td>
</tr>
<tr>
<td>Pentium™</td>
<td>60-100MHz</td>
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Note that you can buy a 286 that is rated for a higher speed than a 386 or a 386 that is rated for a higher speed than a 486. However, the megahertz rating is not the only measure of a chip's speed, nor does processor speed alone predict the speed at which an application will run.

3. How much memory, that is, random access memory (RAM), does the computer have?

Buy a computer with at least two megabytes (2MB) of RAM. If you plan to multitask or run Windows, you should purchase at least 4MB of RAM. To really enjoy the features of a graphical operating environment, go for 8MB or more RAM. Good questions to ask the salesperson include: "How many empty slots will be available for me to install more RAM?" and "Can I buy standard RAM for this computer, or will I need to order special proprietary memory from you for a higher price?"

4. How many wait states does the processor use when accessing RAM? Does the machine have a Static RAM (SRAM) cache to speed access to its memory?

The fewer the wait states, the faster the computer can get data from memory. Although many computers will now run with zero wait states, one wait state is still common. Avoid computers with more. Computers with SRAM caches will almost always be faster than computers with the same processor and no cache, but they cost more.

5. How many floppy drives does the computer have? What size and capacity are they?

Two sizes of floppy disk drives are common, 5.25 inch and 3.5 inch. The 5.25 inch
drives use floppy disks with a capacity of either 360K or 1.2MB (formatted) and the 3.5 inch drives have a capacity of either 720K or 1.44MB (formatted). Generally, IBM PC class (8088 or 8086-based) machines will use a 5.25 inch drive and a 360K floppy disk. AT class (80286-based) machines will use 5.25 inch drives with 1.2MB floppy disks. New machines may come with 3.5 inch drives. IBM has recently come out with 2.88MB, 3.5 inch drives on some of its models. Most dealers will install any type of drive you want in an AT or better class machine.

The GSLIS Lab currently has 80486 and 80386-based machines with 3.5 inch drives that take 1.44MB disks but will also read and write to 720K disks. Some machines also have 5.25 inch drives that use 1.2MB or 360K disks. Most of our Macintosh computers are able to read information from the 3.5 inch 1.44MB IBM floppy disks.

Floppy drives that use 1.2MB floppy disks--also referred to as high density disks--can read from and write to 360K disks. However, a 360K disk that has information on it put there by a high density drive may not be readable by a 360K drive.

6. **What size and type of hard drive does this computer have?**

Given the size of most standard application programs, a hard drive in addition to one or more floppy disk drives is a very good idea. Don't buy one smaller than 80 MB--even at 80MB, your hard drive is likely to fill up quickly. Hard disk space is presently available from $.60 per megabyte to $2.00 per megabyte. Larger hard disks usually have a lower price per megabyte.

Speed was once an issue in Hard Disk performance, and many salespeople are still stuck on that idea. A good hard disk today will have a small built-in RAM cache that stores information for quick access. Most PC operating systems, including DOS and OS/2, also have a 'software cache' that will speed up the hard disk even more. Because of these hard and soft caches, the hard disk speed (i.e. 16 milliseconds access time) emphasized by sales people will not be important when you're actually using the computer.

Two popular types of hard disk are sold for IBM compatible computers today: IDE and SCSI. IDE hard drives come in sizes up to 600 megabytes. A computer with an IDE controller can control two IDE hard drives without special adjustments. SCSI hard drives come in sizes up to four gigabytes. A computer with a SCSI controller can control up to seven SCSI devices (hard drives, CD-ROM drives, Scanners, Printers, Tape Drives, etc.) without special adjustments. SCSI is smarter and faster. It is also more complicated and more expensive. Older hard drive formats, such as MFM, RLL, and ESDI should be avoided.

7. **What kind of video adapter and monitor does the computer have?**

There are dozens of video adapters available. Each will be built around a video display 'chipset' and come with special software called 'display drivers' to allow you to see a certain number of pixels and colors on the monitor. As you can probably guess, more
pixels and more colors cost more money.

Standard display formats include Hercules, VGA, SVGA, and XGA. Here are some common combinations of screen resolution and colors:

<table>
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<th>RESOLUTION (IN PIXELS)</th>
<th># OF COLORS THAT CAN BE DISPLAYED</th>
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<tbody>
<tr>
<td>640x480</td>
<td>16, 256, 32K, 64K, 16million</td>
</tr>
<tr>
<td>800x600</td>
<td>16, 256, 32K, 64K</td>
</tr>
<tr>
<td>1024x768</td>
<td>16, 256, 32K</td>
</tr>
<tr>
<td>1280x1024</td>
<td>16, 256</td>
</tr>
</tbody>
</table>

If the computer motherboard supports local bus access to the CPU, you may be able to purchase a local bus display adapter. In theory, this will allow the video card to redraw the screen much faster. In reality, local bus video adapters can only work faster when the software drivers have been specially rewritten.

Monitors work together with display adapters to control what you see. A monitor must be able to understand and display all of the pixels and colors coming from the computer’s display adapter. A good monitor is able to synchronize with many speeds and resolutions of display adapters. This is often advertised as a 'Multisync' monitor. At the higher resolutions (1024x768 pixels and above), many people are annoyed by interlaced video, which redraws the screen at half speed, like a television. Monitors that prevent this are sold as Non-Interlaced.

VGA is an old IBM graphics standard. It will display very nice text and graphics in 16 colors at a resolution of 640H x 480V or in 256 colors at a resolution of 320H x 480V. It is also possible to buy a VGA monochrome system. This will allow you to see graphics reproduced at the same resolutions listed above, but with a gray scale instead of color. Purchasing such a system may be a good way to save money if color is not necessary but the ability to display high resolution graphics is important.

Super-VGA (256 colors, 800H x 600V) is the current standard for IBM-compatibles. It adds some additional high resolution modes to VGA, however, your software will not take advantage of the higher resolution modes unless you have software drivers to tell it how. If you are running Windows, however, you can make good use of the extra resolution and colors. A resolution of 800x600 makes good use of a small 14” monitor.

XGA (1024H x 768V) is IBM’s latest graphics standard. When available on an IBM, XGA generally requires the purchase of an additional adapter. Most Super-VGA adapters for IBM-compatibles now support equivalent or higher resolutions without the purchase
of an additional card.

8. **How many parallel and how many serial ports does the computer have?**

Parallel ports are most often used to connect a printer to your microcomputer. Serial ports are most often used to connect a modem to your computer--for communicating with other computer systems via the phone lines. You may also connect a mouse to a serial port. Don’t buy a computer without at least one of each. Many people want two serial ports, one for a modem, and one for a mouse.

9. **What is the bus speed of this computer?**

There are several kinds of data busses used on IBM-compatibles, the old AT or industry standard architecture (ISA) and the extended industry standard architecture (EISA). If you are buying a computer with an ISA bus, the bus speed should not run faster than 8MHz. It is also an advantage to be able to adjust the speed of the bus. Computers with the EISA bus are more expensive and generally used for network file servers or very high performance applications. A local bus allows special expansion cards to communicate directly with the central processor at speeds as high as 40Mhz. Two types of local bus are VESA-standard local bus and PCI local bus. In order to take advantage of the local bus, you must purchase special adapter cards that will not work with the other types of busses.

10. **How many free expansion slots will I have after my system is fully configured? How many 8-bit, 16-bit, and 32-bit slots?**

Do not ask this question until you have decided how your system will be configured. Slots are places in your computer in which you may install circuit boards or cards which enhance the functioning of your computer. These cards may include display adapters, hard drive controllers, CD-ROM player controllers, I/O cards for extra parallel or serial ports, RAM cards for more memory, etc. Until you have chosen a display adapter, chosen a hard drive, and determined how many parallel and serial ports your computer will have, you will not be able to determine the number of free slots. In general, the more free slots, the better, however, slots take up space. A computer with a lot of expansion slots will take up a lot of space on your desk.

IBM PC and XT compatibles used 8-bit slots only. AT compatibles have both 16-bit and 8-bit slots and use what is now called the industry standard architecture or ISA bus. Machines based on the 80386 or 80486 chips may have special 32-bit slots that are used for extra RAM. Machines with an MCA or EISA bus can have either 16 or 32-bit busses. Generally, the number of bits determines the amount of information which can be transferred over your computer's bus at one time; more bit equals more information equals a faster computer. Your fully configured computer should leave you at least two free slots.
Questions about the dealer's policies

1. Do you have a 30-day (or longer), money back guarantee?

2. How long is the warranty period? Is the warranty on the computer the same for all components (i.e., the hard drive, the video adapter, etc.)?

3. Will there be any charge for returning the computer if there is some problem?

4. If the computer needs repair, can you do it in the shop, or will you have to send the unit back to the manufacturer? Does the computer come with, or can I purchase, a contract for on-site repair?

5. What is your policy on technical support? Can I call and talk to a technician? Is there a limit on, or a charge for telephone support? If the dealer is local: Will you come to my house to install the system?

Questions specifically for mail order dealers

1. Is there a surcharge for using a credit card? (Don't even consider paying by cash or check. When you pay by card and there is a problem with the order, you can refuse payment on the charge. If the credit card company can't resolve the problem, it may take the loss rather than you.)

2. What will shipping cost?

3. Do you have an 800 number for technical support? Do you offer a dial-in bulletin board for help? How about Internet support in the form of E-mail or UseNet newsgroups?