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ORACAS CERTIFIED COMPUTER EXPERT

Part 1 - Advanced Computer Hardware

By

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Ch. 1. Introduction to Computer Hardware

Computer

Computer is an electronics device; it gets instruction, process and gives us information. Another words Computer is a data processors machine.

Modern computers are electronic and digital. The actual machinery, wires, transistors, and circuits are called hardware; the instructions and data are called software. It places the Computer in the bottom of the computer hierarchy:

Mainframe Computers: A powerful multi-user computer capable of supporting many hundreds or thousands of users at once, an example is IBM model 390.

Minicomputers: A multi-user computer capable of supporting from 10 to hundreds of users at once. Minicomputers are large powerful machines. They typically serve a network of simple terminals. IBM's AS/400 is an example of a minicomputer.

Supercomputer: An extremely fast computer that can perform hundreds of millions of instructions per second.

PC / Micro Computer / Digital Computer: Personal Computer is small, single-user computer based on a microprocessor. In addition to the microprocessor, a personal computer has a keyboard for entering data, a monitor for displaying information, and a storage device for saving data. They work on DOS, Windows, or similar operating systems. They are used for standard applications.

Workstations: A powerful, single-user computer. A workstation is like a personal computer, but it has a more powerful microprocessor and a higher-quality monitor. They have the power to handle complex engineering applications. They use the UNIX or sometimes the Windows Server, Windows NT operating system.

Types of PC / Micro Computer / Digital Computer

There are following types of digital computers:-

- Desktop Computers



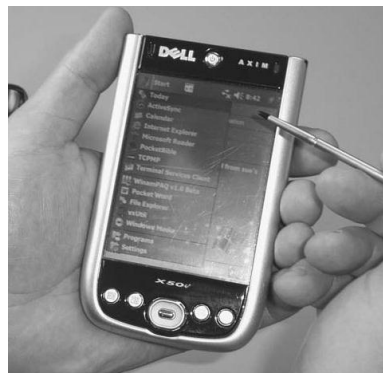
- Laptop / Note Book Computers



- Net-book Computers



- Palmtop Computer/ PDA (Personal Digital Assistant)



Hardware & Software

There are two major parts of Computer.

- Hardware
- Software

Hardware

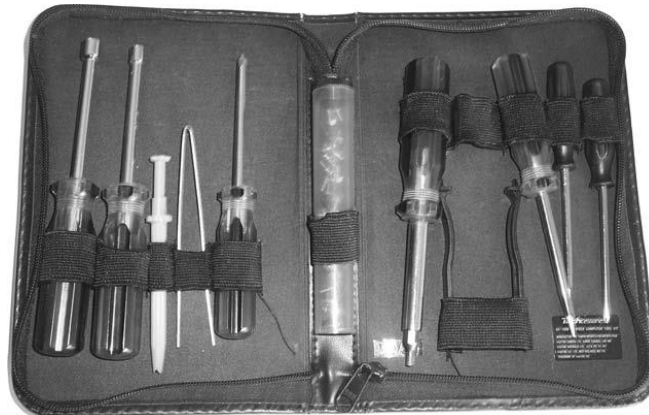
Computer those parts, we can touch are called Hardware, in another word, All computer components are its Hardware, Processor, RAM, Main board, Hard Disk etc. are example of Hardware.

Software

Computer those parts, we can't touch are called Software, in another word, All computer programs are its Software. Microsoft Windows, Microsoft Word, Yahoo Messenger, Internet Explorer etc. are example of Computer Software.

Hardware tools

Of the myriad pieces of hardware you need to repair computers, the most popular is the humble screwdriver.



Software tools

Here is information about the software tools you need in your PC repair toolkit, but I want to introduce them here so you get a more complete listing of the tools you will use in the field:

1. Windows boot disk / Oracas Software Solution 2010:

A Windows boot disk contains the core boot files that are needed to boot a Windows operating system. If those files go missing off the hard drive, you can boot the operating system from the boot disk.

2. Windows Installation Disc / Oracas Windows Express Disc:

The Windows disc can help you install new Windows in your hard disk.

3. Driver Installation Disc / Oracas Driver Solution 2008:

The Driver solution is use for installing proper device drivers for any hardware change you made.

4. Oracas Windows Live Disc:

Live CD is the general term used for booting and running the operating system from CD, you can use them to help retrieve your data when the operating system will not boot.

Data

Any thing we want to store in computer is stored in the form of “Data”. Means any thing stored in computer is called “Data”. For Example: Any song, movie or wallpaper stored in computer is included in data.

Analog data

The signals, which we send each other to communicate, are data. Our daily data have many forms: sound, letters, numbers, and other characters, handwritten, printed, photos, graphics, film. All these data are in their nature analog, which means that they are varied in their type. In this form, they are unusable in a PC.

Digital data

The PC is an electric unit. Therefore, it can only deal with data, which are associated with electricity. That is expert using electric switches, which are also off or on. You can compare with regular household switches. If the switch is off, the PC reads numeral 0, If it is on, it is read as numeral 1. With our electric switches, we can write 0 or 1. We can now start our data processing!

Storage Devices

Devices used to store data are called “Storage Devices”, for example USB Flash Drive, Hard disk, Floppy drive, CD, Memory Cards are storage devices.

Memory

The capacity of computer to store any data is called its “Memory”. There are two types of memory:-

- RAM
- ROM

RAM

RAM is the abbreviation of “Random Access Memory”. This is the kind of memory which stores data in computer till the computer is switched on. As soon as the power is off, the data will be vanished e.g. RAM in your computer.

ROM

ROM is the abbreviation of “Read-only Memory”. This is the kind of memory which can be read but can not be written, edited or updated e.g. CD-ROM, BIOS, EP ROM etc.

Bits

The smallest unit of memory is “Bit”. Each 0 or 1 is called a bit. Bit is an abbreviation of the expression Binary digit. It is called binary, since it is derived from the binary number system.

| | |
|----------|-------|
| 0 | 1 bit |
| 1 | 1 bit |
| 0110 | 4 bit |
| 01101011 | 8 bit |

The binary number system is made up of digits, just like our common *decimal* system (10 digit system). But, while the decimal system uses digits 0 through 9, the binary system only uses digits 0 and 1.

| | | |
|-----------|---|-----------------|
| 8 Bit | = | 1 Byte |
| 1024 Byte | = | 1 KB (Kilobyte) |

| | | |
|---------|---|------------------|
| 1024 KB | = | 1 MB (Megabyte) |
| 1024 MB | = | 1 GB (Gigabyte) |
| 1024 GB | = | 1 TB (Terabyte) |
| 1024 TB | = | 1 PB (Petabyte) |
| 1024 PB | = | 1 EB (Exabyte) |
| 1024 EB | = | 1 ZB (Zettabyte) |
| 1024 ZB | = | 1 YB (Yottabyte) |

Note:

- “Kb” stands for “Kilo bit”
- “KB” stands for “Kilo Byte”

If the alphabet “B” is in capital writing like “B”, then it stands for “Byte”. On the contrary if it is in small alphabet like “b” then it stands for “Bit”.

Input and Output:

Input: Any instruction or command that we send to Central Processing Unit is called input.

Output: After processing of our instruction computer give us result, called output.

Parts of Computer

Computer is divided into three main parts:

- Input Devices
- Output Devices
- Central Processing Unit

Input Devices:

Those devices are use to give input in Central Processing Unit, are called Input devices.

- Keyboard
- Mouse
- Microphone
- Touch Screen LCD
- Joy Stick

Output Devices:

Those devices are use to get output from Central Processing Unit, are called output devices.

- Monitor/LCD (Liquid Crystal Display)
- Printer
- Speakers
- Projector

Central Processing Unit:

A major part of Computer that gets input, process it and give us output.

Inside the Central Processing Unit

Inside the Central Processing Unit consist of following hardware components:

1. Processor
2. Main/System/Mother Board
3. System Memory / RAM
4. Storage Devices
 - a. Hard Disk Drive
 - b. Removable Storage Devices / Drives
 - i. FDD (Floppy Disk Drive)
 - ii. ZIP Drive
 - iii. Flash drives/Thumb drives
 - iv. SD / CF Cards
 - v. Optical Devices
 1. CD-ROM Drive
 2. CD- RW Drive
 3. DVD-ROM Drive
 4. DVD-RW Drive
 5. Combo Drive
 6. Super Drive / Multi Drive
 7. Blu-ray Drive
5. Expansion Cards / Interface Cards and Devices
 - a. Video Graphics Array / Adapter (VGA) / Display Adapters / Card
 - b. Sound Card
 - c. Local Area Network Card
 - d. Fax Modem Card
 - e. TV Tuner / Card
 - f. Wireless LAN / WiFi (Wireless Facility)
 - g. Blue Tooth
 - h. Media / Memory Card Reader
 - i. USB Interface Card / USB Hub
 - j. Express and PCMCIA Card
6. Power Supply Unit
7. Computer Case
8. Ports, Cables and Connectors

1. Processor

Although all components of the computer function together as a team, every team needs a leader – someone who gives instructions and keeps everyone working toward the same goal. If any PC component were considered the team leader, it would probably be the central processing unit (CPU), also known as the processor. The key word here is central, which implies “center” or “focus.” The CPU can be considered the focus of the computer because it controls a large number of the computer system’s capabilities, such as the type of software that can run, the amount of total memory that the computer can recognize, and the speed at which the system will run.

The processor is the “brains of the organization,” so to speak. It is designed to do very few things, but to do them extremely quickly. The processor performs a limited set of calculations based on requests from the operating system and controls access to system memory. Processor speed is measured in several different ways, including clock cycles or megahertz (MHz), and millions of instructions per second (MIPS). Any of these measures gives you an estimate of the processor’s speed/power.

Processing Speed

Processor speed is how fast a processor executes its instructions or commands. This speed was originally measured in millions of hertz, or megahertz (MHz), per second. A hertz is also known as a clock cycle, and a processor can execute code at every clock cycle. Thus, a processor operating at a measly 1 MHz per second can execute one million tasks every second. Processors today now measure their speed in gigahertz (GHz) per second.

A gigahertz is one billion clock cycles per second – so the CPU can execute tasks a billion times per second! Although processor speeds is not the only factor affecting performance, in general, the faster the processor, the faster the system.

Cache memory

The processor accesses information that resides in system memory is a slower process than if the information is stored in the processor’s own special high-speed memory, known as cache memory. Cache memory is integrated right into the processor’s chip and is made up of static RAM (SRAM). The two types of cache memory are Level 1 (L1) cache and Level 2 (L2) cache. L1 cache is built into the processor, whereas L2 cache resides outside the processor.

Data bus

A city bus is responsible for transferring people from one location to another. In the world of computers, a bus is responsible for delivering data from one location on the PC to another. Data bus is the term used to define the pathway between the processor and memory. Because the processor accesses information from memory so often, an entire bus – the data bus – is dedicated to this action. The larger the data bus, the more data can be carried from the CPU to memory in one clock cycle.

If a processor has a 16-bit data bus, it can deliver – at most – 16 bits during a single clock cycle. If the same processor needs to deliver 32 bits of information, it has to take two trips: sending 16 bits during the first clock cycle and the remaining 16 bits during the next clock cycle. Taking that same 32 bits of information and processing it on a 32-bit processor means that the information will be delivered in one trip, which increases the overall efficiency of the system.

Address bus

To store information into system memory, your processor has to give an address that points to a particular storage location; only the address doesn't look like B2. It looks something like 10, or maybe 11, which are two completely different memory locations. As a result, the data would get stored in two different blocks. Your processor accesses memory locations through the address bus.

| | A | B | C | D |
|---|---|---|---|---|
| 1 | | ↓ | | |
| 2 | → | • | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

Math co-processor

The math co-processor, also known as the numeric processing unit (NPU), is the processor's sidekick. Systems with math co-processors can well outperform systems that do not because the math co-processor takes some of the workload off the CPU.

Hyper Threading

Hyper Threading is a feature designed by Intel that was placed in the Pentium processors. Hyper Threading technology, or HTT, allows a processor to logically act as two different processors by being able to execute simultaneous threads. A thread is a part of an application that executes at any given time. For a system to truly be able to take advantage of multithreaded applications, you normally need a system that has multiple processors – one processor to run one thread at a time. With hyper threading, one processor can run more than one thread at a time, increasing performance by 15 to 30 percent.

Multicore

A Multicore processor combines a number of independent processors and the L1 cache from those processors onto a single processor chip. The benefit of a Multicore processor is that it can execute multiple threads at the same time without “Hyper Threading” because you essentially have multiple processors in one chip package. The core features also include each core having its own L1 cache memory. Multicore processors also have a block of shared L2 cache between the two processors in the Multicore chip. A huge benefit of being only one chip on the motherboard is that the one Multicore chip draws less power than two separate processors would. A number of different flavors of Multicore processors are available today, such as dual-core, triple-core, and quad-core processors. Here are the differences between the three:

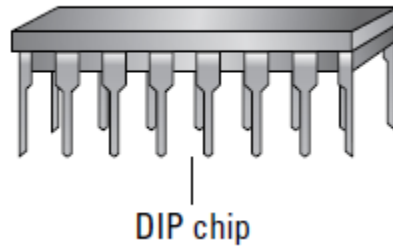
- Dual core: Has two cores in one chip package, with each core typically having 128K of L1 cache and 512K of shared L2 cache.
- Triple core: Has three cores in one chip package with each core typically having 128K of L1 cache. Most triple-core processors also have 512K of L2 cache per core and share a block of cache memory, known as L3 cache.
- Quad core: Has four cores in one chip package with each core typically having 128K of L1 cache. Most quad-core processors also have 512K of L2 cache per core and share a block of L3 cache (2MB-6MB).

Chip packaging

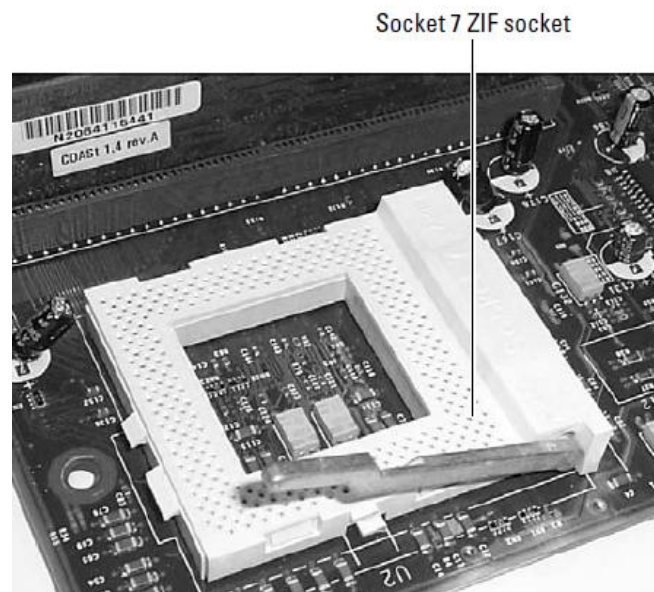
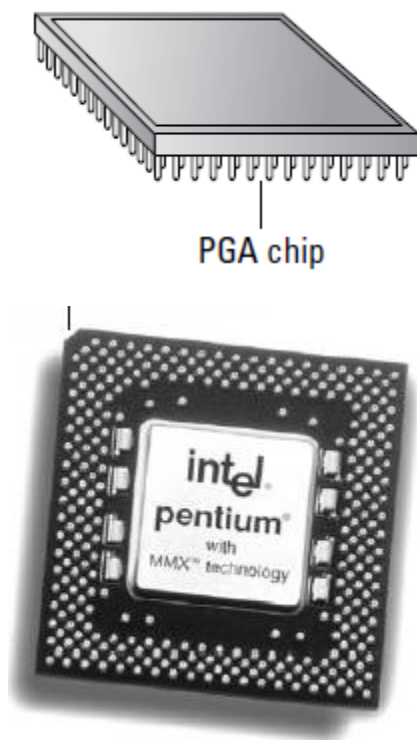
Chip packaging refers to how the chip is constructed and delivered to the consumer. The chip package defines the appearance or form factor of the chip.

- Dual inline package (DIP) chip: A rectangular chip with two rows of 20 pins. Pin 1 is located at the end of the chip that has a square notch carved into it. It is important to identify pin 1 because when you add a DIP chip to the motherboard, you have to match pin 1 on the chip with pin 1 in the chip socket. Older processors (such as the 8088) and many math co-

processor chips use the DIP chip style. Although they are no longer used for CPUs, DIP chips are still used for cache memory and BIOS chips on motherboards.



- Pin grid array (PGA) chip: One of the most popular processor chip packages in use today, the PGA chip is a square chip with an array of pins filling up the shape of the chip. In general, the PGA chip uses hundreds of pins. You can locate pin 1 on the PGA by identifying the corner of the PGA chip that has the corner cut off – that corner is where pin 1 is located. Today's implementation of the PGA chip fits into a zero insertion force (ZIF) socket. ZIF socket has a lever (on the side of the socket) that you lift to raise the chip from the socket, because the chip is automatically raised out of the socket.



- Single Edge Contact (SEC) chip: A chip package type that was popular with the Pentium processors, the SEC chip is a huge cartridge surrounded by a plastic casing. The newer version, SEC2, is implemented as a card that is inserted into a slot on the motherboard and doesn't have the big plastic casing around it. It is important to stress that the SEC and SEC2 are inserted into a slot and not a socket. This chip is also known as "Slot 1" Processor.
- Land grid array (LGA) chip: One of newest processor chip packages in use today is LGA chip is a square chip without an array of pins.



| Socket | Processor | No. of Pins |
|---------------------------------------------|---------------------------------------------|-------------|
| Socket 8 | Pentium Pro | 387 |
| Socket 370 | Celeron and Pentium III | 370 |
| Socket 423 | Pentium 4 | 423 |
| Slot 1 | Pentium II and Pentium III | 242 |
| Socket 775 or LGA775 (also called Socket T) | Pentium 4, Pentium D, Celeron D, Core 2 Duo | 775 |
| LGA1366 (also called Socket B) | Intel Core i7 processor | 1366 |

| | | |
|-----------------------|---------------------|--------------|
| Pentium 1 | (60 MHz - 200 MHz) | 32 Bit (x86) |
| Pentium 2 | (233 MHz - 450 MHz) | 32 Bit (x86) |
| Pentium 3 | (450 MHz - 1.3 GHz) | 32 Bit (x86) |
| Pentium 4 | (1.3 GHz - 4.0 GHz) | 32 Bit (x86) |
| Pentium D (Dual-Core) | (1.6 GHz - 3.2 GHz) | 64 Bit (x64) |
| Core 2 Dou | (1.6 GHz - 2.4 GHz) | 64 Bit (x64) |
| Core 2 Quad | (2.0 GHz - 2.4 GHz) | 64 Bit (x64) |

Intel Processors

Pentium

The original Pentium processor, released in 1993, was developed at speeds of 60 MHz and 66 MHz. The Pentium processor was a PGA chip that was placed in Socket 5 or Socket 7. Soon after its release, Intel marketed Pentium processors in 75, 90, 100, 120, 133, 150, 166, and 200 MHz flavors, which were really just clock multipliers of the original 60 MHz or 66 MHz systems.

Clock multiplying is the concept that the processor will run faster than the motherboard that the processor sits in. For example, the original Pentium processor ran on 60 or 66 MHz motherboards. Say that the computer is marketed as a Pentium 90. Because you know that the motherboard runs at 60 or 66 MHz, you can determine that the 90 comes from 60×1.5 —meaning that the processor runs 1.5 times the speed of the motherboard.

Pentium Pro

In 1995, Intel released the Pentium Pro chip, which added a new level of performance to the Pentium processor. The Pentium Pro had all the characteristics of the Pentium processor — such as a 64-bit data bus and 32-bit registers — but it increased the address bus to 36 bits, which means that the Pentium Pro could access 64GB of RAM. The speed of the Pentium Pro ranges from 120 MHz to around 200 MHz.

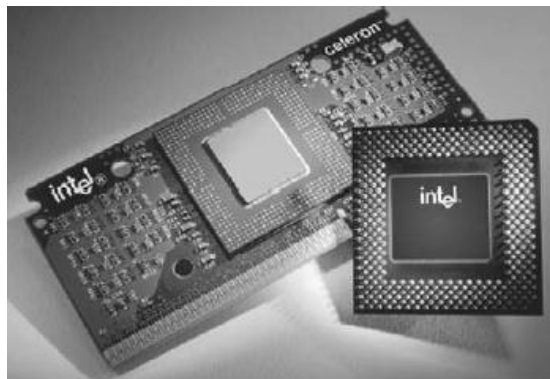
Pentium II

In 1997, Intel produced the Pentium II, which was really just an enhanced Pentium Pro with speeds ranging from 233 MHz to 450 MHz. The Pentium II had a 64-bit data bus, a 36-bit address bus (64GB of RAM), and 32-bit registers; and supported features such as MMX.

Intel packaged the Pentium II in the Single Edge Contact (SEC) that fits into Slot 1 on the motherboard.

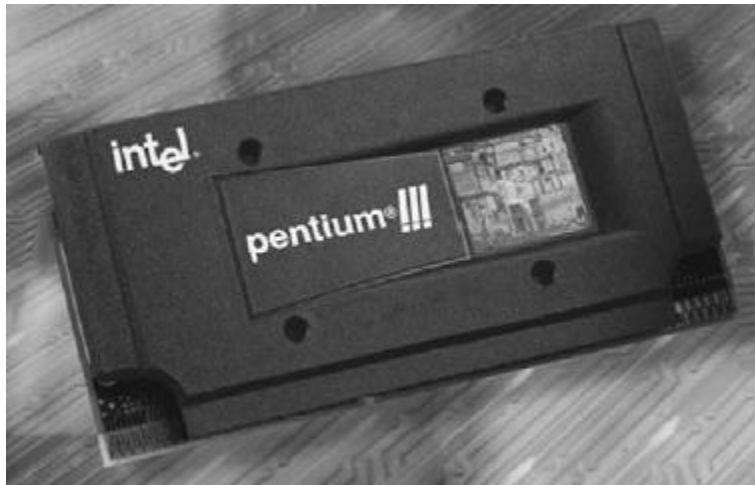
Celeron

The Pentium II processor performed very well, and with all that cache memory, it should! Unfortunately, that performance came with a price. If you were not willing to pay that price, Intel created a chip for you: the Celeron chip! The first-generation Celeron chip was code-named the Covington; it has no L2 cache memory on it. The second-generation Celeron was codenamed the Mendocino, and it contains 128K of L2 cache. Although this version of the Celeron does have L2 cache, it is dramatically reduced from the Pentium II's 512K so that it can be sold at a lower price. The original Celeron shipped in an SEC package but also had a version that was packaged as a PGA.



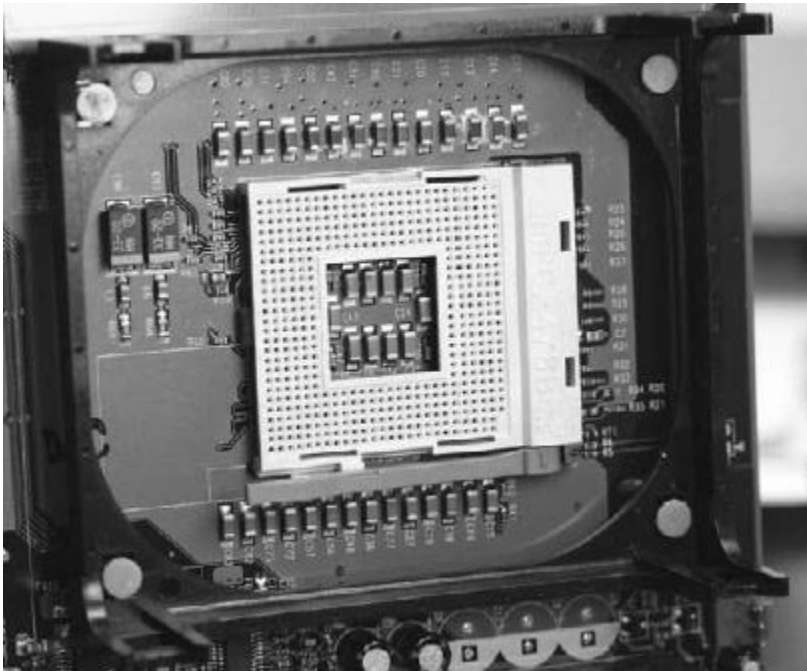
Pentium III

The Pentium III processor shares many of the Pentium II characteristics. It supports dynamic execution (as the Pentium Pro also did) and MMX technology, has 32K of L1 cache, and has either 256K or 512K of L2 cache. The Pentium III runs at a speed of 450 MHz to 1000 MHz (1GHz). The Pentium III chip offers 70 additional instructions that are integrated into the chip, enhancing the user's experience with 3-D graphic applications. The Pentium III chip also supports a number of low-power states to help conserve energy when the system is not in use. This processor is designed to run on either 100 MHz or 133 MHz motherboards. The Pentium III processor shipped in the SEC2 package originally, but was then packaged as a PGA chip. The SEC2 goes in Slot1, and the PGA chip is inserted into Socket 370.



Pentium 4

The Pentium 4 processor runs between 1.3 GHz and 4 GHz. The Pentium processor has 20K of L1 cache and 512K of L2 cache. The processor is shipped as a 423-pin or 478-pin PGA package, which means that the chip will be placed in Socket 423 or Socket 478.



The Pentium 4 processor gets a huge performance benefit by being able to perform four data transfers in one clock cycle along the front side bus (FSB), which is the bus that connects the processor to system memory.

Pentium M

For years, laptop manufacturers have been asking for smaller processors to place in laptop systems, and they finally have their wish. A number of processors have come out with the M version, which stands for mobile. The mobile versions of the processors are smaller than the processors that go in desktop systems, so they fit better and also use a lot less power. The benefit of using less power also means that they run much cooler.

Intel Core 2

Intel designed the Intel Core 2 to be its 64-bit, Multicore processor. The Core 2 comes in three flavors:

- Core 2 Solo: Single-core processor
- Core 2 Duo: Dual-core processor on the one chip
- Core 2 Quad: Actually two chips, with two cores per chip, packaged in a multi chip module

Core 2 processors range in speed from 1 GHz to around 3 GHz and fit into an LGA 775 socket, also known as Socket T. Core 2 processors come with either 2MB of L2 cache or 4MB of L2 cache.

Intel Atom

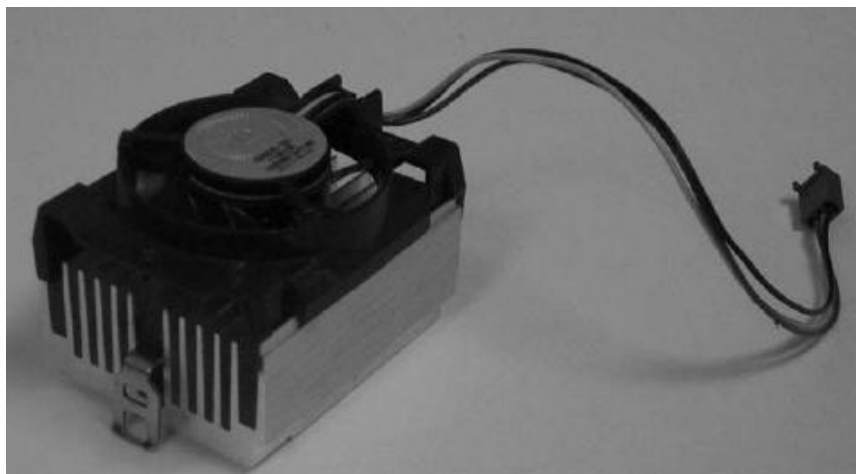
Intel has created a processor to run on the now-popular Netbook. A Netbook is a laptop-like computer – but much smaller – that is used primarily for Internet usage. The Netbook is much smaller and cheaper than a regular laptop system and is marketed for e-mail and Web browsing features. The Intel Atom has many characteristics of normal processors – it runs between 1 GHz and 2 GHz and contains 32K of L1 cache and 512K of L2 cache. Originally the Atom processor had one instruction pipeline, but there are versions with two instruction pipelines. There are also single core and dual core versions of the Atom processor.

Processor Cooling

After you have the processor in the processor socket, you need to install something to keep it cool, such as a heat sink or fan – or maybe even both.

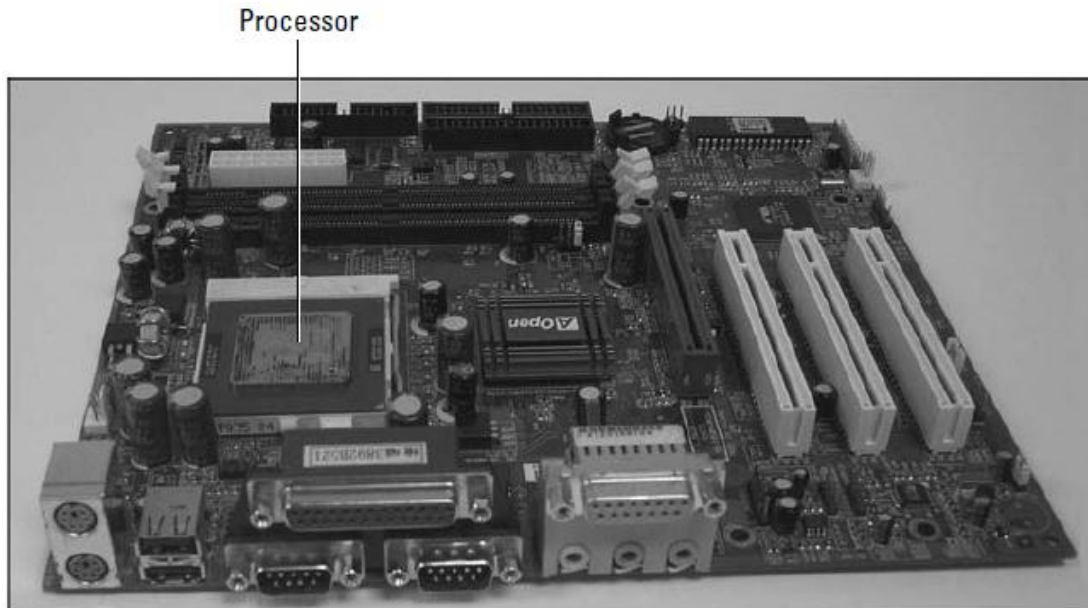
Heat sinks and CPU fans

Heat sinks are a group of metal pins placed on the chip to draw heat away from it. A cooling fan is a small fan placed on top of the processor to pull away hot air, helping to keep the processor cool.



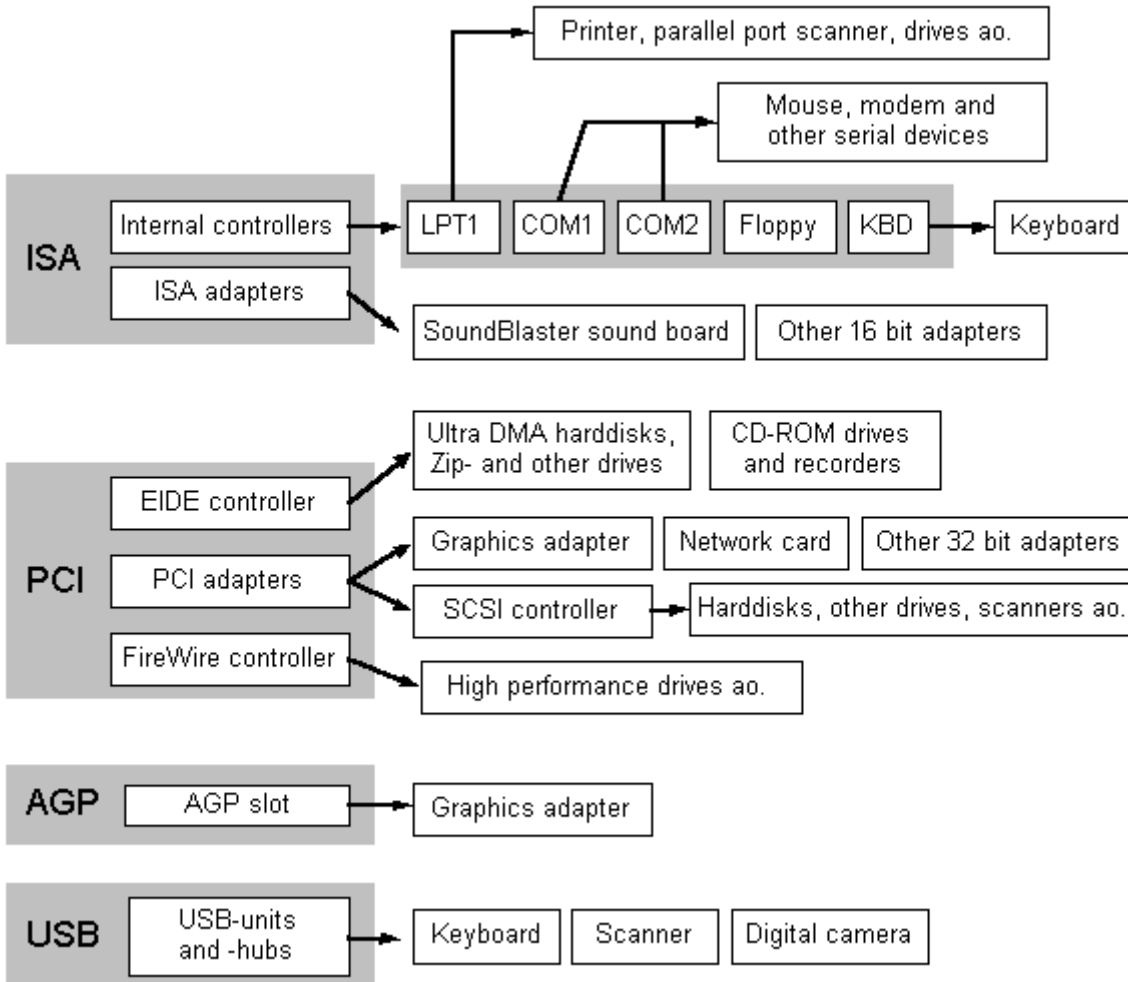
2. Motherboard

One of the major replaceable components in your computer is the system board, also known as the motherboard. The motherboard is the big green board (that might not be a technical description, but I think that looking inside your system will demonstrate that it is an accurate one) connected to the computer case. It is the motherboard that holds your RAM, processor, and a number of other components in place.

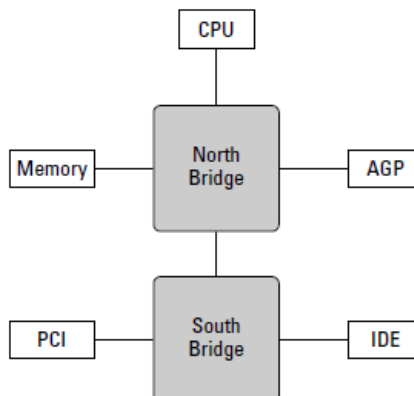


a. Motherboard chipset

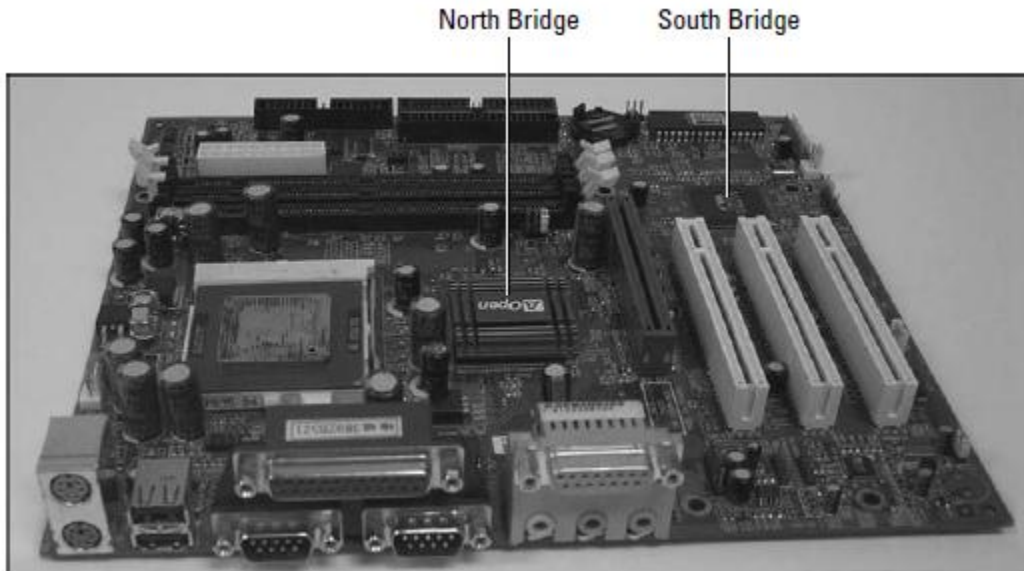
Each hardware component in the system has circuitry responsible for managing a specific hardware part. This circuitry is the controller for that specific piece of hardware. For example, access to memory is controlled by the memory controller, the hard disk is managed by the hard disk controller, and the keyboard is managed by the keyboard controller.



The combination of computer chips that hold the logic for these controllers is the motherboard chipset. Together, the computer chips make up the chipset control communication from the CPU to each of the hardware devices in the system. Two chips that make up a big part of a motherboard's chipset are the North Bridge and the South Bridge.



The North Bridge chip is responsible for communication from the CPU to memory, the CPU to the PCI Express bus and the Advanced Graphics Port (AGP) device (more on AGP later in this chapter). The South Bridge chip is responsible for communication between the CPU and other devices, such as PCI, ISA, and IDE devices. These two chips contain the bulk of the logic that allows a CPU to communicate with other hardware.



b. RAM Slots / Sockets

When you look at a motherboard, one of the first items that should stand out is the processor; the next things you will usually notice are the memory slots used to install RAM into the system.

c. Cache memory

Cache memory increases performance by storing frequently used program code or data that can be later accessed by the processor. Cache memory is much faster memory than normal RAM and, as a result, is more expensive. The system stores data accessed from RAM in cache memory when the data is accessed the first time, making subsequent requests to the same data faster because the data is accessed from cache (faster than RAM) for subsequent calls.

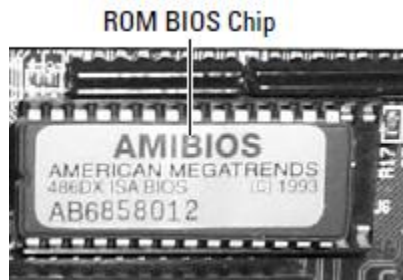
All processors today have integrated cache memory, which is known as level 1 cache. Integrated cache is cache memory that is built into the processor, while nonintegrated cache – known as external cache – is built outside the processor, typically on the motherboard. The types of cache are as follows:

- L1 (level 1) cache: Cache integrated within the processor
- L2 (level 2) cache: Cache located outside the processor, usually on the motherboard

d. BIOS chip

The basic input-output system (BIOS) is the low-level program code that allows all the system devices to communicate with one another. It is usually rectangular and generally features a label with the manufacturer's name and the year the chip was manufactured. Some of the popular manufacturers are AMI, AWARD, and Phoenix.

The BIOS chip is a read-only memory (ROM) chip, which means that you can read information from the chip, but you can't write to the chip under normal circumstances. Today's implementations of BIOS chips are EEPROM (electrically erasable programmable ROM), which means that you can get special software from the manufacturer of the BIOS to write to the chip.



BIOS Update

If BIOS supports a hard disk up to 200GB in size, but that you want to install larger hard disk instead. What can you do about it? You can contact the BIOS manufacturer and get an update for your BIOS chip, which is usually a software program. Running the software program writes new instructions to the BIOS to make it aware that there are hard disks bigger than 200GB and provides instructions for dealing with them.

POST

The BIOS chip also contains code that controls the boot process for your system. It contains code that will perform a Power-on Self-Test (POST), which means that the computer goes through a number of tests, checking itself out and making sure that it is okay. After it makes it past the POST, the BIOS then locates a bootable partition and calls on the master boot record, which loads an operating system.

CMOS

CMOS (complementary metal-oxide semiconductor) is the type of manufacturing process that creates most integrated circuits. The term complementary refers to the fact that these chips use negatively and positively charged transistors (which complement each other) to store information, that include

- Which hard drives and floppy drives are present
- How much memory is installed
- Whether a keyboard is required to boot
- The type of mouse installed (PS/2 or serial)
- What are the reserved resources (such as IRQ [interrupt request], I/O addresses, and DMA [direct memory access] channels)
- What is the power-on password and whether it is required to boot up the system
- The date and time
- Whether ACPI (Advance Configuration Power Interface) is enabled and what devices it applies to

COMS Battery

The computer keeps track of its inventory in what is known as the complementary metal-oxide semiconductor (CMOS). CMOS holds a listing of system components, such as the size of the hard disk, the amount of RAM, and the resources (IRQs and I/O addresses) used by the serial and parallel ports. This inventory list is stored in CMOS RAM.



Configuration

The PC must be configured, be supplied with this information. That is done in the factory or store, where it is assembled. This information is stored in CMOS, where they stay. CMOS data only need to be updated, when different or additional hardware components are installed. This could be a different type hard disk or floppy disks or a new RAM type. Other data in CMOS contain various user options. Those are data, which you can write to CMOS. For example,

1. Adjust date and time
2. Adjust Boot Option
3. Power Management
4. Password Protection
5. Check Configuration
6. Control Devices
7. IDE /SATA Devices Detection

Manufacturer of BIOS

All PC's have instructions in ROM chips on the system board. The ROM chips are supplied by specialty software manufacturers, who make BIOS chips. You can read the name of your BIOS chip during start-up. You can also see the chip on the system board. The primary suppliers are:

- Phoenix
- AMI (American Megatrends)
- Award

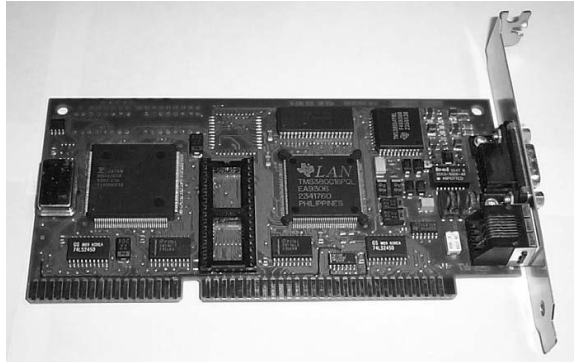
e. Expansion slots

Most motherboards have one or more expansion slots, which add functionality to the computer. For example, assume that your computer doesn't have sound capability; you can install a sound card into the expansion slot to add that capability to your system.

There are probably some white, narrow PCI slots on the board, as well as an AGP slot (used for video cards). You might also see some larger black slots; these are ISA slots used by older devices. Most motherboards today do not have ISA slots, or might have only one.

ISA Slots

The Industry Standard Architecture (ISA) was the first major expansion bus architecture. It was originally developed as an 8-bit architecture and then evolved into a 16-bit architecture. The ISA bus architecture has a speed of 8 MHz, which is extremely slow by today's standards.

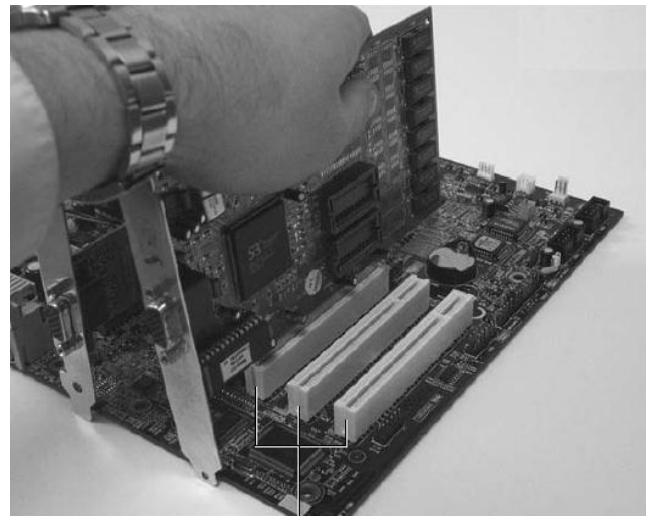


EISA Slots (Extended Industry Standard Architecture)

In 1988, the industry standard for expansion cards was still ISA, but bus architectures had already been created that performed better. So a number of companies got together with the goal of extending ISA while maintaining backward compatibility so that companies could use their existing ISA cards. As a result, the Extended Industry Standard Architecture (EISA) was developed as a 16- and 32-bit architecture. The big advantage to EISA is that it maintains support for the ISA cards that some companies already have in large quantities, and it also supports 32-bit EISA cards. EISA also included the major advancement in expansion bus technology that MCA (Micro Channel Architecture) created – bus mastering. Because both ISA and EISA cards fit into the same slot, they keep the same speed of 8 MHz.

PCI Slots

Peripheral Component Interconnect (PCI) has two flavors: 32-bit cards and 64-bit cards. When Pentium systems hit the market, their motherboards featured both ISA/EISA slots and PCI slots. When buying a new card today, you would most likely buy a PCI device for one of the PCI slots in your system. The 32-bit version of PCI has a speed of 33 MHz, and the 64-bit version of PCI runs at 66 MHz. PCI also supports bus mastering. One of the other major benefits of PCI is that it is Plug and Play architecture. If you are running plug and Play operating system, such as Windows, and your computer has a Plug and Play BIOS, the system resources (such as IRQs and I/O addresses) are dynamically assigned for PCI components.



PCI slots

PCMCIA

Personal Computer Memory Card Industry Association (PCMCIA) is a unique type of expansion bus architecture because of its small size. PCMCIA is popular in laptop computers. After all, how can you get a big network card like the one in a desktop computer into a little laptop to add network support?

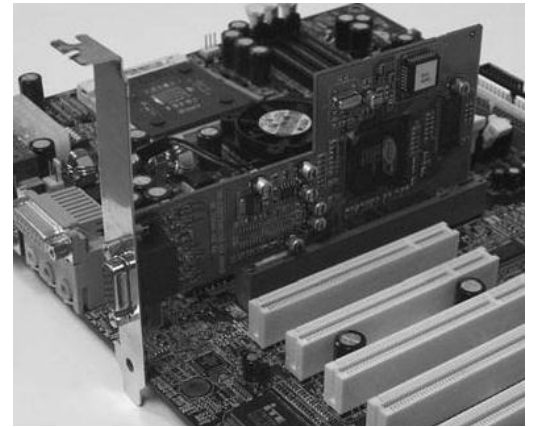
The answer is that you can't; you have to purchase a PCMCIA network card for the laptop to add network support. PCMCIA cards, also known as PC Cards, are a little bit larger than a credit card and can fit into your back pocket.



AGP Slot

Advanced Graphics Port (AGP) has been around since the Pentium II processor appeared in 1997. It's a 32-bit bus architecture that runs at 66 MHz, which is twice the speed of the PCI bus. Many older motherboards have one AGP slot to hold an AGP video card. The performance gain from the AGP port comes not only from the increase in speed, but also because the AGP bus has a direct path to the processor so that information travels quickly from the processor to the AGP card.

AGP can run in different modes, and the different modes dictate the speed of the bus. 1x mode runs at 66 MHz (266 MBps), 2x runs at 133 MHz (533 MBps), 4x runs at 266 MHz (1.07 GBps), and 8x runs at 533 MHz (2.2 GBps)!



PCI-X Slot

One of the newer bus architectures to arise on the market over the last few years is the Peripheral Component Interconnect Extended (PCI-X) bus architecture. Because PCI-X uses the same connector style as PCI, it is totally compatible with PCI in the sense that it can hold PCI cards. So, a motherboard with PCI-X slots can also house older PCI cards – and that is a great feature! Like PCI, PCI-X is 32-bit and 64-bit bus architecture and is available in four different speeds: 66 MHz, 133 MHz, 266 MHz, and 533 MHz.

PCI-E Slot

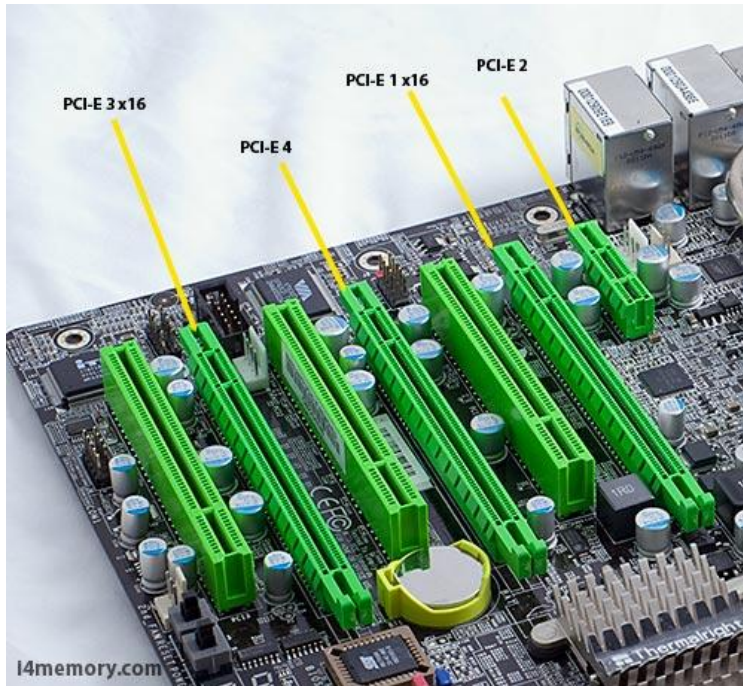
PCI-X is compatible with PCI by being able to hold PCI cards and also sending data in parallel (multiple bits at one time), but the PCI-E (PCI-Express) bus architecture takes a totally different approach. PCI-E is a serial bus that does not support existing PCI cards. The PCI-E slot is smaller than a normal PCI slot, so it can't possibly house a PCI card.



PCI-E uses data lanes to transfer the information within the bus architecture. A data lane delivers an amazing transfer rate of 250 MBps per lane. PCI-E has different implementations, each of which has a different number of lanes identified by a multiplier. For example, PCI-E with only one lane is known as x1, and a PCI-E bus with eight lanes is known as x8. PCI-E can thus reach fast transfer rates by implementing additional lanes. For example, current graphics cards for PCI Express have

16 lanes that provide a transfer rate of 4 GBps (16 x 250 MBps) – which is twice the rate of AGP 8x, which runs at 2 GBps.

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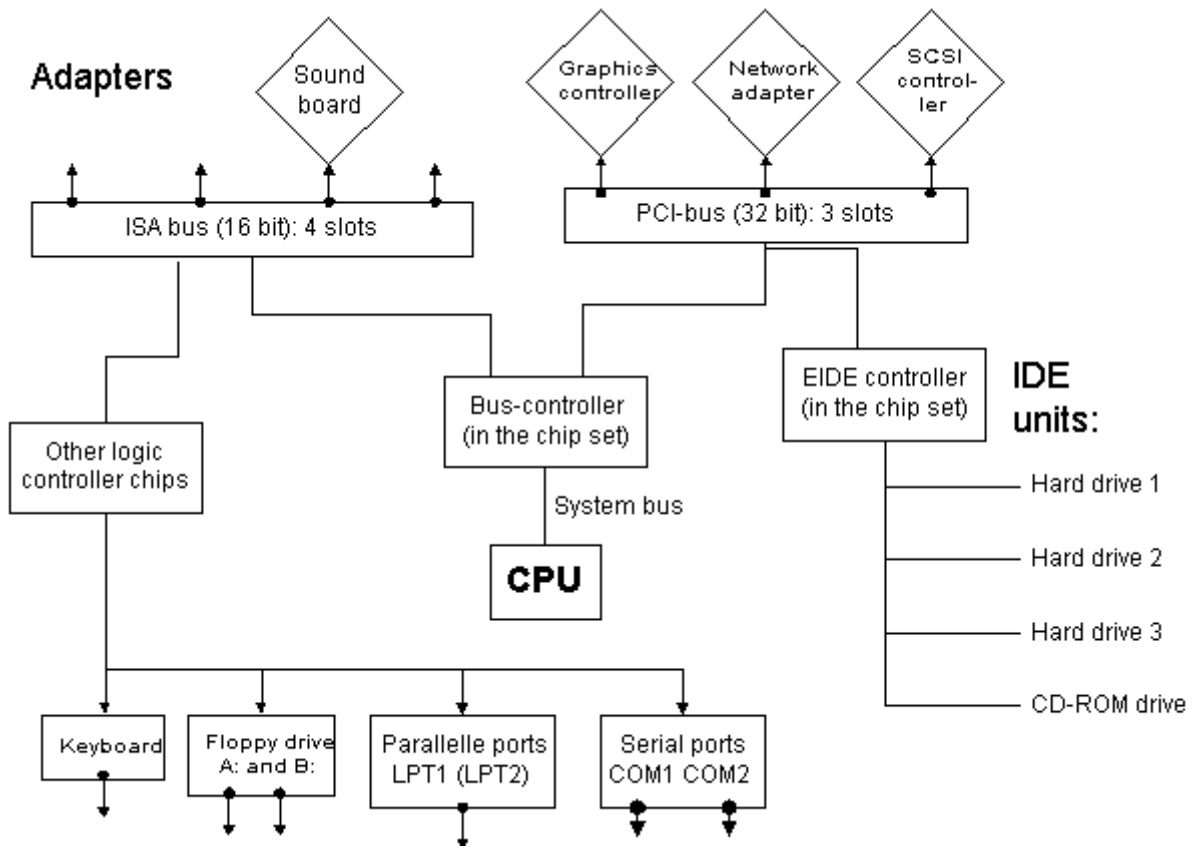
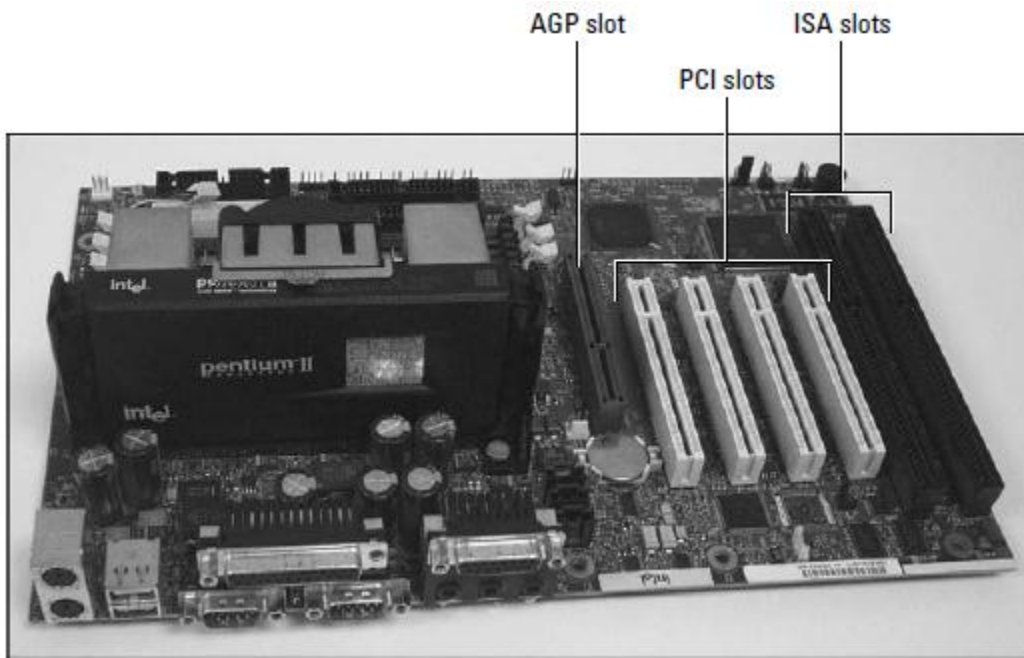
can thus reach fast transfer rates by implementing additional lanes. For example, current graphics cards for PCI Express have 16 lanes that provide a transfer rate of 4 GBps (16 x 250 MBps) – which is twice the rate of AGP 8x, which runs at 2 GBps.

AMR and CNR

Audio/Modem Riser (AMR) is a newer bus architecture that adds a modem and audio card to the system. AMR allows the two components to be incorporated into a single card to reduce cost.

CNR (Communication and Network Riser) is another bus architecture that has come out in recent years, used to implement LAN, audio,

and modem functionality all in one.



f. External Ports / Connectors

A number of ports on the back of the motherboard connect the keyboard, mouse, printer, and other devices to the system. The ports given at the back of mother board are called external ports. There are following ports found normally on a mother board.

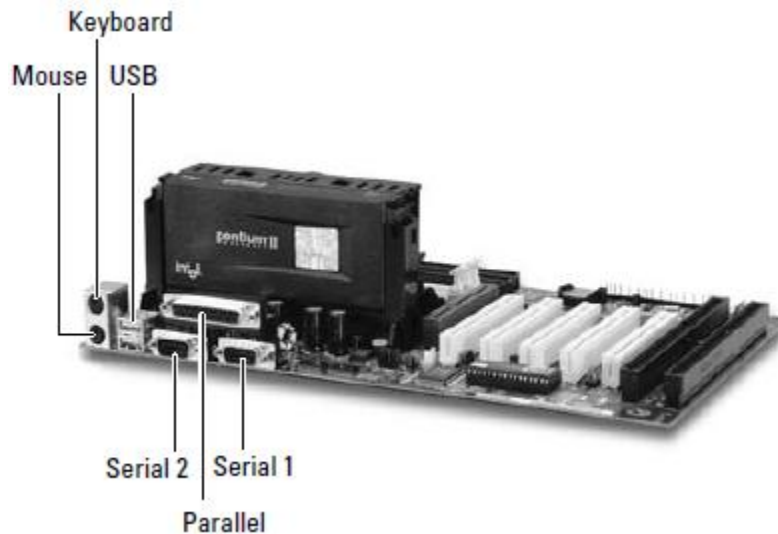
- PS/2 Port (Personal System 2)
- Serial / COM Port (Communication Port)
- USB Port (Universal Serial Bus Port)
- VGA Port (Video Graphic Adaptor)
- Parallel / LPT Port (Local Port)
- LAN / Ethernet / NIC /RJ-45 Port (Local Area Network)
- Sound Channels
- Power Connector



Serial ports

Most motherboards have serial ports integrated directly into the board. The serial ports are also known as communications (COM) ports. They are called serial ports because they send data in a series – a single bit at a time. Serial ports on the back of the motherboard are one of two types:

- DB9-male: A serial port with 9 pins
- DB25-male: A serial port with 25 pins



Parallel port

Another type of connector on the back of a motherboard is the parallel port, also known as the printer port, or LPT1. The parallel port gets its name by being able to send information eight bits at a time. Whereas serial ports send only one bit at a time in single file, parallel ports can send eight bits in one operation – side by side, rather than single file.

Video Port

A motherboard come with a built-in video adapter, sometimes called a video card or video controller. The video adapter converts digital data from the processor and prepares the information to be displayed onscreen. The video port is a 15-pin female port.

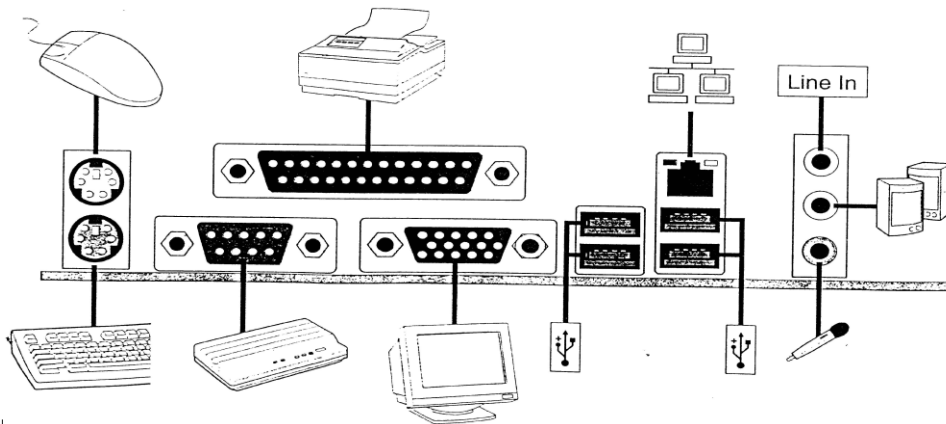
Keyboard/mouse connectors / Ports

The mouse and keyboard connectors on motherboards today are most likely PS/2 (Personal System 2) style connectors or USB connectors. Focus on PS/2 connectors for now. A PS/2 connector is a small, circular six-pin connector. Older motherboards might have a DIN keyboard connector, also known as an AT connector, if your systems did not have any other ports on the back of the system, so you needed to insert an I/O card for other ports (such as serial and parallel ports).

Sound Ports

Most motherboards today have built-in sound capabilities, allowing you to connect speakers and a microphone to the computer. Figure 1-16 shows the integrated sound ports on a motherboard. The three different ports on the integrated sound card are

- Line-in: This port (Blue) allows you to connect many audio sources to the system.
- Line-out: This port (Green) allows you to connect speakers to the computer.
- Mic-in: This port (Red) allows you to connect a microphone to the system for recording.



LAN and mode...

A number of systems today have built-in network support via an integrated network interface card (NIC) / Ethernet / LANN or network card for short. The built-in network card has an RJ-45 port on the back of the system that looks like an oversized telephone jack.

USB ports

Universal Serial Bus (USB) is a high-speed serial technology that transfers data at 12 Mbps (USB 1.0), 480 Mbps (USB 2.0), and up to 5 Gbps for USB 3.0. One of the major benefits of USB is the fact that all USB devices use the same type of connector.

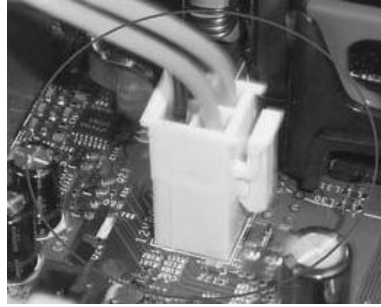
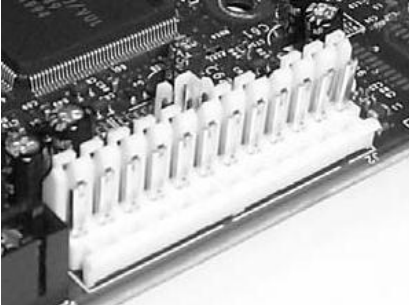
FireWire (IEEE 1394) Port

When USB 1.0 was introduced, it ran at 12 Mbps. This was a fairly good speed for most types of devices but was a little too slow when it came to multimedia devices, such as digital video cameras. Typically, these types of devices use a FireWire connection, which has a transfer rate of up to 400 Mbps and supports 63 devices in a chain. This is a huge jump compared with the USB 1.0 standard. The official standard that defines FireWire is known as the IEEE 1394.



g. Power connectors

All the devices connected to the motherboard need to get power from somewhere, so the power supply is connected to the motherboard, which supplies power to the board.

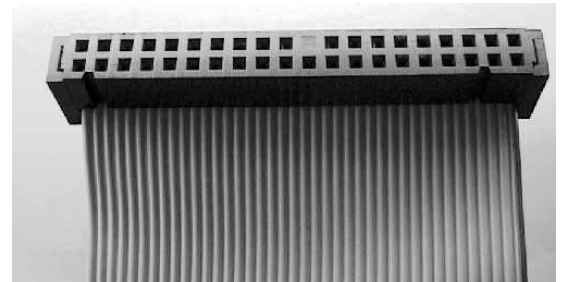
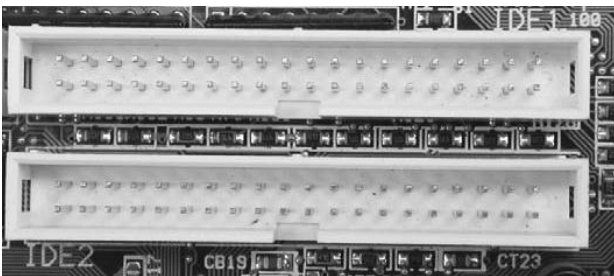


h. IDE Connectors / Controller

As you might already be aware, the hard drives are used to store information permanently on the computer, but to access that information the drives have a physical connection to the system via the motherboard. Before you purchase a hard disk to add to the system, you need to be aware of what types of drives your Mainboard supports. The four major types of drives in systems today are;

- IDE (Integrated Drive Electronics)
- SATA (Serial Advanced Technology Attachment)
- SCSI (Small Computer System Interface)
- FDD (Floppy Disk Drives)

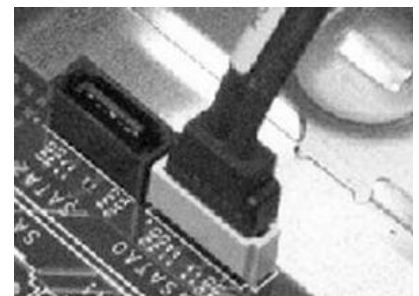
IDE drives have been around since the 1980s, and although the technology has improved from a performance perspective, IDE drives connect to the system the same way they always have. If your motherboard supports IDE, you will have two IDE connectors that are made up of 40 pins each. You connect the drive to the connector on the motherboard by using a 40-wire or 80-wire IDE ribbon cable/IDE data cable. This ribbon cable typically has two connectors on it.



When connecting the IDE ribbon cable to the drive and motherboard, the colored wire on the ribbon cable connects to pin 1 on the connector.

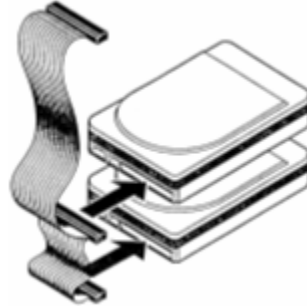
i. SATA Connectors / Controller

Limitations of the IDE architecture have kept its data transfer rate around 150 MBps. As drives become more powerful, a new standard is needed. The first new standard to replace IDE — SATA — is the popular drive technology in desktop and laptop computers. SATA can reach transfer rates of up to 600 MBps! This is quite a bit (450MB, to be exact) faster than the 150 MBps offered by high-end IDE drives.



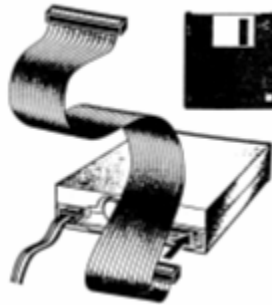
j. SCSI Connectors / Controller

Some high-end machines, particularly those designed for use as servers, might have a controller on the motherboard with 50 pins on it. This is the footprint of a SCSI (Small Computer System Interface) controller. Because SCSI devices outperform IDE devices, SCSI controllers are extremely popular for servers (which have greater hard disk access and storage needs than regular desktop computers). To connect a SCSI drive to the 50-pin SCSI connector on the system, you use a 50-wire ribbon cable



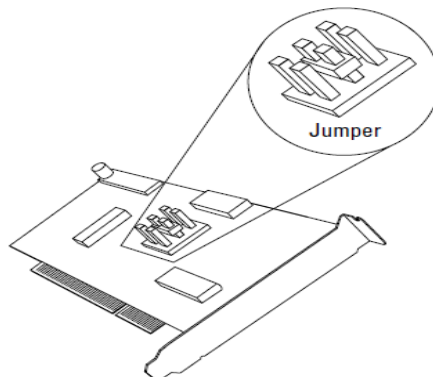
k. Floppy Disc Drive Connector / Controller

Located very close to the IDE connectors on the motherboard, you should see a smaller floppy drive connector that contains 34 pins instead of the 40 pins found with the hard drive IDE connectors. The floppy drive connector on the motherboard is used to connect the floppy drive to the motherboard using a 34-wire ribbon cable.



l. Jumpers and DIP switches

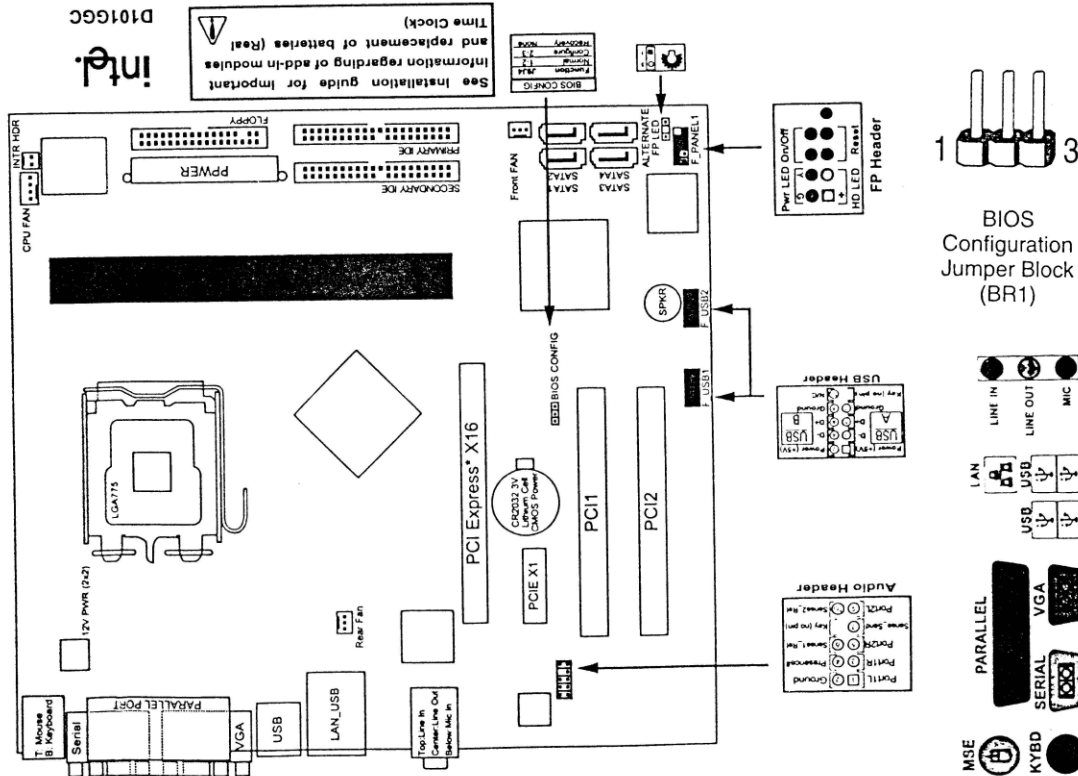
A jumper is a set of pins that have a plastic cap enclosed over them to create an electrical connection. The plastic cap contains a piece of metal that makes contact with the pins and creates the electrical circuit. The circuit that is created enables a feature on the motherboard. Most motherboards (and older expansion cards) use jumpers to implement different settings.



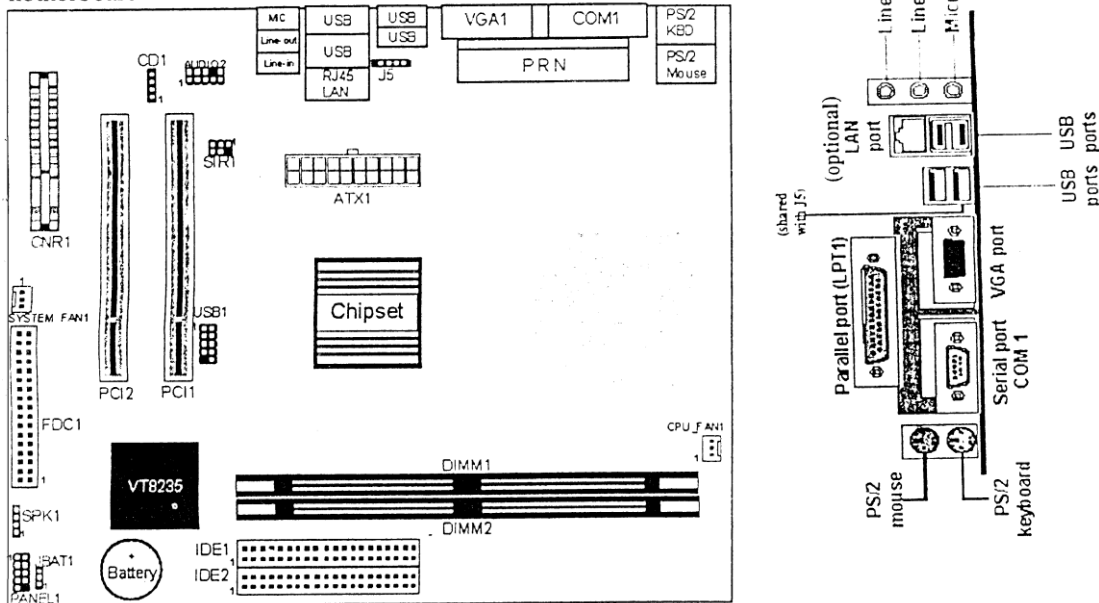
Types of Motherboards

Now that you understand some of the major components of the motherboard (system board), it is important to mention the different motherboard form factors. A motherboard form factor just describes the dimensions of the motherboard and the layout of the motherboard components.

You need to understand the different motherboard form factors because you can't just take any motherboard and place it in a computer case. For example, you must put a full AT motherboard in a full AT case, a Baby AT board in a Baby AT case, and an ATX board in an ATX case.



Use the diagram below to identify the major components on the motherboard.

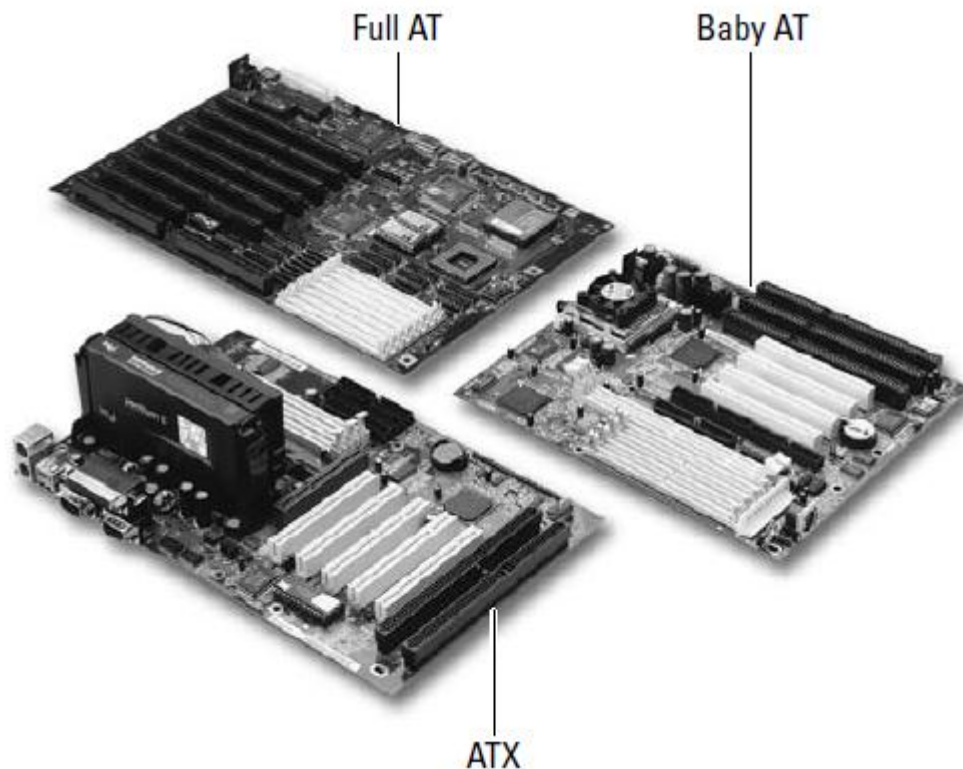


AT

The full AT motherboard – 12" wide and 11" long – is easily recognized by the fact that it has only a keyboard connector on the back of the motherboard and that it contains no other I/O ports.

The full AT suffers from a problem with accessing some items on the motherboard because the drive bays hang over the motherboard. This configuration makes installing and troubleshooting motherboard components very difficult.

Another problem with the layout of the full AT board is that the expansion cards, after having been inserted into the systems, cover the processor. This situation leads to cooling problems because ventilation is insufficient to keep the chip from overheating. Figure 1-30 displays a full AT motherboard being installed in a full AT case.



Baby AT

The Baby AT motherboard form factor had been one of the most popular motherboard types until recent years. The Baby AT board is 8.5" x 10". A Baby AT board is about two-thirds the size of a full AT board and typically incorporates a Socket 7 ZIF slot for classic Pentium processors. The Baby AT board usually has a mixture of ISA/EISA and PCI slots located on the motherboard and includes a Plug and Play BIOS.

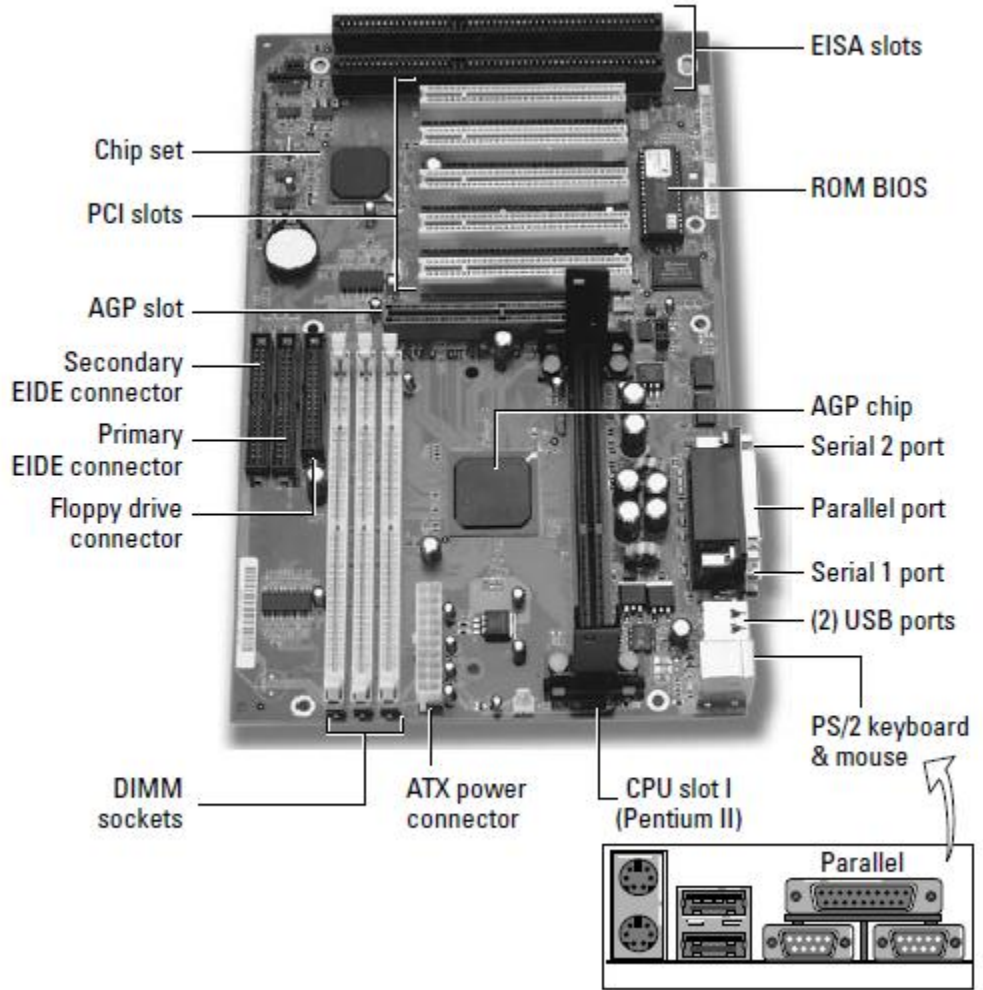
ATX

In 1995, Intel wanted a motherboard that would support the Pentium II processor and the new AGP slot, the ATX board – 7.5" x 12" – has most of the I/O ports integrated directly into the board, including USB ports.

The ATX motherboard incorporates the I/O ports and includes an AGP slot for high-performance video cards.

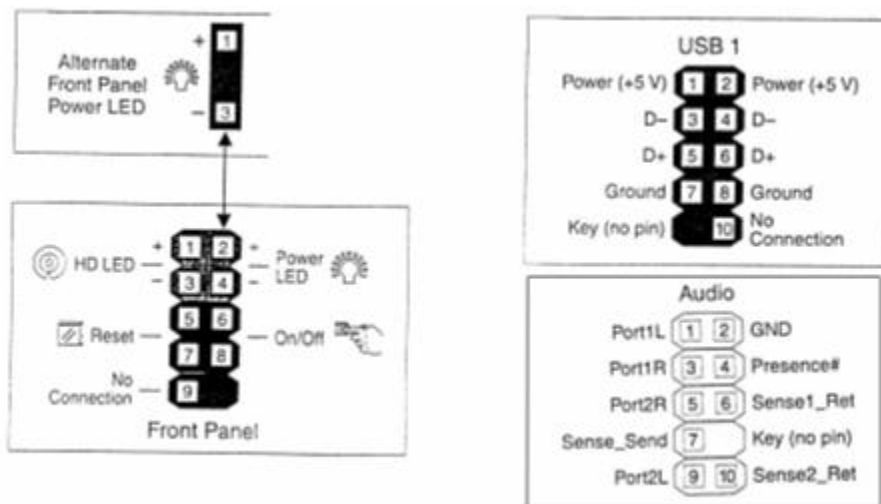
MicroATX and FlexATX

Smaller versions of the ATX motherboard are the microATX and FlexATX. The microATX motherboard form factor is 9.6" x 9.6" and can fit in either a micro-ATX case or a normal ATX case, known as a full ATX case. Measuring 9" x 7.5", the FlexATX is smaller than the microATX but can fit in an ATX or a microATX case. FlexATX is not as popular because the size of the motherboard limits how much you can expand the system. The important point to make here is that when you purchase a motherboard, you must ensure that it fits your case.



Another motherboard form factor that was designed to replace the ATX form factor and create smaller, low-profile systems is the Balanced Technology extended (BTX) motherboard form factor.

m. Front Panel



n. Motherboard Built-In Devices

There are several devices which are already fitted in a mother board. Those devices are called Built-In devices.

- Graphics Card / Display Card / VGA Card / Video Card / 3D Card
- Sound Card
- LAN Card / NIC (Network Interface Card/Controller) /Ethernet Card
- USB-Interface Card

Built-In Devices in Laptop Main Board

- Graphics Card / Display Card / VGA Card / Video Card / 3D Card
- Sound Card
- Fax Modem Card
- LAN Card / NIC (Network Interface Card/Controller) /Ethernet Card
- Wireless LAN /Wi-Fi (Wireless Fidelity)
- Blue Tooth
- Media Card Reader
- USB-Interface Card

Note:

If any mother board does not consist of built-in graphic card, sound card or LAN card, then these are to be fixed externally on their respective ports.

o. Motherboard top Manufacturers



3. System memory

System memory works the same way. You have documents and applications stored on the hard drive. When you want to work on these documents, you open them and place them in the computer's work area. The work area for a computer is system memory. When you want to work with any application or document, the computer must retrieve that information from the hard drive and execute it from memory

ROM

ROM is a type of memory that you cannot write to, read-only memory. Information is written to ROM chips by the manufacturer, and this information cannot be changed. In the past, if ROM information needed to be updated, you had to remove the original ROM chip and replace it with an updated ROM chip from the manufacturer. Today, you can update the ROM by running a special software program downloaded from the manufacturer's Web site.

EPROM

EPROM (erasable programmable ROM) is a type of memory that normally cannot be written to because it is a variation of ROM. An EPROM chip is a special ROM chip that the manufacturer can reprogram by using a special programming device that uses ultraviolet light.

EEPROM

A newer implementation of ROM is electrically erasable programmable ROM (EEPROM), or flash ROM. The manufacturer writes the software instructions into the ROM chip, but you can update these instructions by running a special software setup program provided by the manufacturer. The software setup program is usually available through the manufacturer's Web site.

EEPROM (better known as flash ROM) is a ROM chip that can be rewritten with special EEPROM update software provided by the manufacturer of the chip.

RAM

Of the two flavors of memory (ROM and RAM), RAM is probably the more fundamental. As I mention earlier, ROM is permanent memory, or permanent storage of information. As the computer's primary working memory, though, RAM stores information temporarily. RAM is unstable, meaning that it needs constant electrical current to maintain the information that resides in its chips. If the electrical current is lost, RAM contents are erased. Likewise, when a computer is powered off, all RAM contents are flushed out.

CMOS RAM

The complementary metal-oxide semiconductor (CMOS) is the area where the computer stores its configuration information, such as whether the computer has a floppy drive, the amount of memory installed, the date and time for the system, and the number and size of the hard drives that are installed, CMOS information stored on the BIOS chip. Think of CMOS information as an inventory list for the majority of components that are installed on the computer.

VRAM

Video RAM (VRAM) is most commonly used on video accelerator cards to store values of pixels onscreen for refresh purposes. VRAM is the favored memory for video because it outperforms the other memory types because it is dual-ported memory: that is, it can be read from and written to at the same time. Comparatively, DRAM is single-ported, which means that the memory can be written to and read from, but not simultaneously – only one direction at a time. VRAM, however, allows you to do both simultaneously.

DRAM

Dynamic RAM (DRAM) is probably the most popular type of memory today and the one that you are most often going to upgrade. Dynamic RAM gets its name from the fact that the information stored in DRAM needs to be constantly refreshed. Refreshing involves reading the bits of data stored in DRAM and then rewriting the same information back. Older implementations of RAM measured the memory's performance based on how long it took the CPU to access that data. This time is measured in nanoseconds (ns; 1 ns equals one-billionth of a second).

Today's implementations of DRAM measure the speed of memory in megahertz (MHz), typically matching the motherboard speeds. For example, my Pentium II system uses 100 MHz memory because it runs on a 100 MHz motherboard.

SDRAM (Synchronous DRAM)

SDRAM is memory synchronized to the system board speed. This synchronized speed means that the data stored in memory is refreshed at the system speed, and data is accessed in memory at the system speed as well. SDRAM is one of the most popular types of DRAM found in earlier Pentium systems, such as the Pentium II. When you upgrade memory on your system and you determine that you need SDRAM, you then need to determine what speed of SDRAM. Because you are running at the system speed, you must match the DRAM speed with the motherboard speed. Thus, if you have a 100 MHz motherboard, you need 100 MHz SDRAM. If you have a 133 MHz motherboard, you need 133 MHz SDRAM.

RDRAM (Rambus DRAM)

When SDRAM was popular, a high-speed flavor of DRAM was on the market RDRAM, which runs at speeds around 800 MHz! RDRAM chips have a 16-bit internal bus width and are packaged together in a 184-pin, gold-plated memory module called a rambus inline memory module (RIMM). To take advantage of this type of memory, you need a motherboard and chipset that support RDRAM. Due to the cost of RDRAM, it lost the popularity contest to SDRAM and finally DDR memory.

DDR DRAM (Double Data Rate DRAM)

DDR memory gets its name from the fact that it can transfer data twice during each clock cycle, compared with SDRAM that can transfer data only once per clock cycle. DDR memory ships in 184-pin DIMM for desktop computers and 200-pin SODIMMs for laptop systems.

DDR memory speed is measured in MHz, like SDRAM is, and is labeled to indicate the speed. DDR memory labeling might look obscure at first because it also indicates the bandwidth by taking the speed and multiplying it by 8 bytes of data (64 bits). Here's how to read DDR memory labeled as PC1600: Divide the 1600 by 8 bytes to get the speed of the memory. In this case, you are looking at 200 MHz memory. PC2700 runs at 333 MHz, and PC3200 runs at 400 MHz. When you upgrade memory on systems that require DDR memory, you need to know the speed of the DDR memory.

DDR2 (Double Data Rate 2 DRAM)

Improvements to DDR memory have already started with DDR2 memory. DDR2 memory runs at speeds 400 MHz and higher, which is where DDR memory left off. DDR2 memory uses 240-pin memory modules and runs at 1.8 volts (V), as opposed to 2.5V for DDR memory. This results in less power consumption for more memory, which is great for laptop users. Popular modules of DDR2 memory are PC3200 (400 MHz), PC4200 (533 MHz), PC5300 (666 MHz), and PC6400 (800 MHz).

DDR3 (Double Data Rate 3 DRAM)

The newer form of DDR memory is DDR3, which offers twice the data rate of DDR2 memory. One of the goals of DDR3 memory is to reduce power consumption; reportedly, DDR3 memory reduces power consumption by about 30%. DDR memory modules are 240-pin DIMMs for desktop PCs and 204-pin SODIMMs for laptop systems. Like DDR2, DDR3 memory is advertised by the speed and transfer rate. For example, DDR3-800 (also known as PC3-6400) is 800 MHz memory that has a throughput of 6400 MBps. DDR3-1066 (also known as PC3-8500) memory has a throughput of 8533 MBps. Another example is DDR3-1600, which is 1600 MHz memory with a transfer rate of 12800 MBps.

Chip Packaging

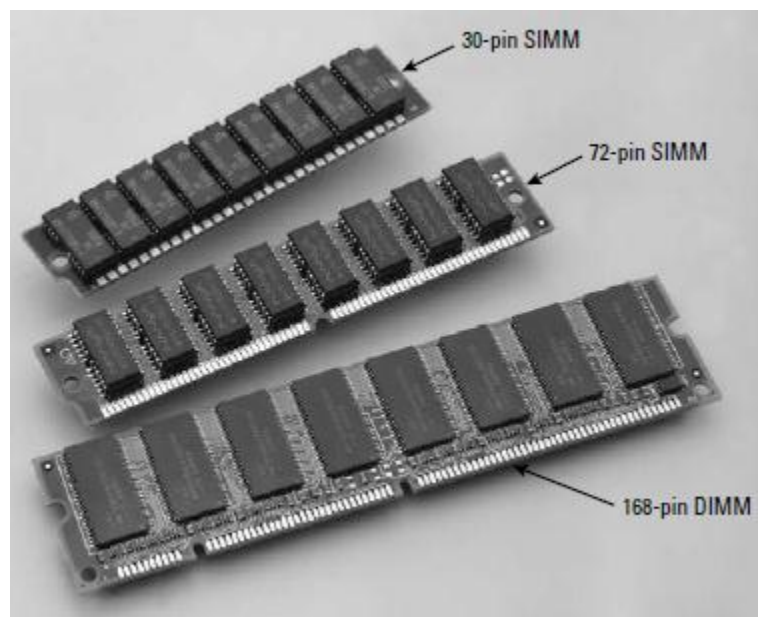
Whether you are purchasing or installing RAM, understanding the different types of memory packages available is important. The following sections identify different memory packages used in desktop computers and laptop systems.

SIMMs

Single inline memory modules (SIMMs) used to be one of the most popular types of memory modules, but they have been replaced by DIMMs (see the next section).

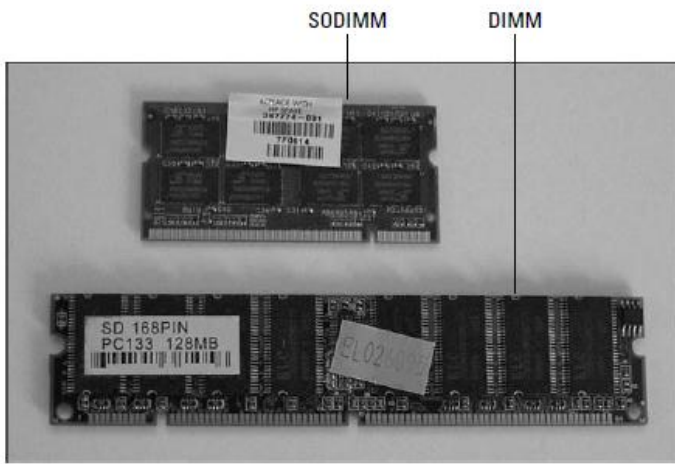
DIMMs

Dual inline memory modules (DIMMs) are like SIMMs, but they supply information in 64-bit chunks. DIMMs come in different flavors that have a different number of pins on the modules. Older DIMMs use 168 pins for SDRAM and 184 pins for DDR memory; and newer DIMMs use 240 pin modules for DDR2 and DDR3 memory. DIMM modules are a little larger than the 72-pin SIMMs.



SODIMM

Small outline dual inline memory modules (SODIMMs) are memory modules that are smaller than normal DIMMs and are used in laptops. A SODIMM comes in three different-sized modules: a 32-bit 72-pin module; a 64-bit 144-pin module (SDRAM); and a 64-bit 200-pin module for DDR and DDR2 laptop memory.



MicroDIMM

A micro dual inline memory module (MicroDIMM) is another memory module used in laptop computers. The MicroDIMM is smaller than the SODIMM and comes in a 144-pin module for SDRAM and a 172-pin module for DDR memory.

RAM top Manufacturer



SRAM

In Static RAM the information held in cells doesn't need to be refreshed – requires less overhead than DRAM to maintain the information stored in memory. With speeds running from 10 ns to 20 ns, SRAM is much faster than DRAM. Because SRAM is faster memory than DRAM, it is also more expensive, which is why people add DRAM to their systems more often than they add SRAM.

SRAM is typically used for cache memory, which stores frequently used data and program code after it is read from slower DRAM. Think of cache memory as a bucket that sits beside the CPU and stores frequently used information.

4. Storage Devices

a. Hard Disk Drive

One of the primary responsibilities of a PC technician is managing hard disks. This responsibility involves more than just partitioning and formatting disks; it also entails installing disks into the computer system and configuring the system to recognize the newly added disks.

Platters

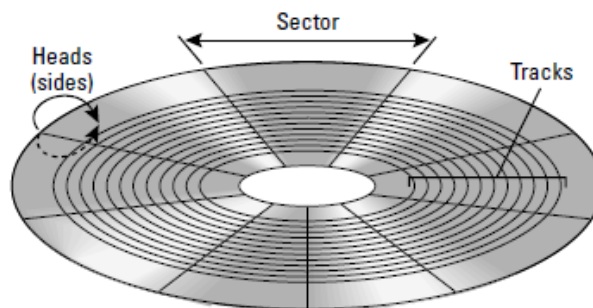
A platter is a physical object (actually, a plate) inside the hard disk that is responsible for storing the data. A platter is similar to a music record and a hard disk has many platters. Each platter surface on the disk has its own read/write head. When information is written to the disk, the read/write head moves to the same track on all platters in a single movement and then writes the data across the same track on all platters. The actuator arm has multiple read/write heads on it.

Tracks

Just like there are grooves (tracks) on a music record, there are also tracks on each platter. These tracks are evenly spaced across the platter's surface

Sectors

The platter is divided into pie-shaped slices, called sectors. Now the confusing thing about sectors is that where a track intersects with a sector, sector blocks are created – also known as sectors! Each sector (block) – 512 bytes in size – is the actual storage area for data.



Clusters

A group of sectors makes up a cluster, which is the allocation unit for a file – meaning where a file is saved. When a partition is formatted, the file system determines the cluster size based upon the partition size.

Master Boot Record

The Master Boot Record (MBR) is the first sector on the first track of the first side of the first platter; it holds the operating system (OS) boot code that controls the loading of the OS.

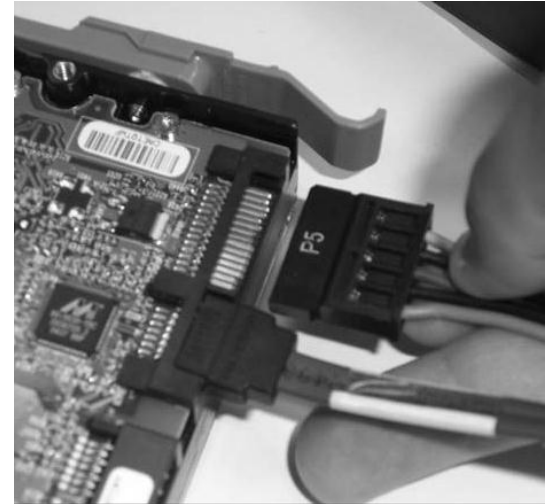
IDE

The hard drive controller is responsible for converting signals made by the system CPU to signals that the hard disk can understand. These signals include instructions on where to find data and how to get to that data. The hard disk performs its task, and any data that needs to be returned is sent to the controller from the hard disk. The controller then converts the signals from the hard disk into signals that the system can understand. In the past, the controller was on an expansion card,

which was connected to the drives via ribbon cables. The goal of IDE was to make the installation of hard disks easier by including the controller on the hard disk, which is where the name comes from: Integrated Drive Electronics (IDE). IDE is also known as PATA (Parallel Advanced Technology Attachment).

SATA (Serial Advanced Technology Attachment)

IDE technology has been around for many, many years, and there has been a big need for a change in hard drive technology. That change came as a new hard drive interface called serial ATA (SATA). IDE is a parallel technology (PATA), and although SATA is a serial technology, it offers great speed and other benefits. SATA is also a lot faster than IDE – approximately 30 times faster, with current speeds of 150 Mbps and future speeds of 600 Mbps.



b. Removable Storage Devices

Not all data storage is hard-wired to the system. Removable storage is the term used for storage media that you take away from the system with you.

i. Floppy Disks Drive

The floppy disk was very popular for storing data and being able to carry the data with you. Floppy disks are not as popular today because they typically can store only up to 1.44MB of data. Today, one picture from a digital camera will use that much space.

A floppy disk has a hard plastic casing with a sliding metal shutter that allows the drive to access the silicon disk inside. The floppy drive comes in different sizes, or formats:

- **5 1/4-inches:** The 5 1/4-inch floppy disk came in two formats: 360KB and 1.2MB. The 5 1/4-inch floppy disk had a soft, flexible shell that did not protect the disk very much. You might not encounter a 5 1/4-inch floppy because they have been obsolete for years.
- **3 1/2-inches:** A 3 1/2-inch floppy disk is the floppy disk that you will most likely encounter, if you encounter one at all. Like with the 5 1/4-inch floppy disk, there is a protective shell, but the shell of this format is hard plastic. The 3 1/2-inch floppy comes in two formats: 720KB and 1.44MB. The 1.44MB format is more common.

ii. Zip Drives

A Zip drive is similar to a floppy drive but a little bit larger physically and stores more information. A Zip drive can store 100MB or 250MB of data, depending on what type of drive it is. These drives were popular solutions for backing up data before CD-ROMs and external drives became popular.

iii. Flash drives / Thumb Drives

Flash drives, also known as thumb drives or memory sticks, are the popular method for carrying data from computer to computer. Flash drives, which can store anywhere from 64MB to multiple gigabytes of information, are relatively inexpensive.

Flash drives are USB devices that you simply plug into the USB port on the computer. Plug and Play kicks in, detects the device, and assigns the drive a letter in the My Computer icon. To access the flash drive, you simply double-click the drive in My Computer and open, copy, and move files as you wish.



iv. SD / CF Cards

Multimedia devices, such as MP3 players and digital cameras, support adding memory to the device by using compact flash cards or Secure Digital (SD) cards. SD cards store data up to 4GB, but a newer SD format – Secure Digital High Capacity (SDHC) – can store information up to 32GB or more. The problem is that SDHC cards cannot be read by SD devices, such as a camera. For a device to be able to read an SDHC card, the device must be compatible with SDHC.



Compact Flash (CF) cards have been very popular but have been replaced by SD cards. SD cards are used by a number of types of devices such as digital cameras, laptops, printers, MP3 players, and PDAs to name a few types of devices. SD cards are a great way to carry your data from one device to another.

v. Optical Devices

Optical storage technology uses a laser to read and write data.

1. CD-ROM Drive

A compact disc-read-only memory (CD-ROM) is an optical storage technology that uses a laser to read data. Originally, CD-ROMs stored 650MB of data and could store 74 minutes of music, but today's CD-ROMs store 700MB of data or 80 minutes of music.

The speed (transfer rate) of the CD-ROM measured in X, 1X CD-ROM had a transfer rate of 150 KBps, and an 8X has a transfer rate of 1200 KBps ($150 \times 8 = 1200$), and a much faster 48X has a transfer rate of 7200 KBps.

2. CD-RW Drive

For many years now, CD drives are writeable: If you want to burn your own CD you can. This makes CD drives much more popular than the older floppy drives because of the amount of information you can store on the CD – a great solution for backing up your data!

The two types of writeable CDs are CD Recordable (CDR) and CD ReWritable (CDRW). The difference between them is that you can write to CDR only once, but you can reuse a CDRW many times by reformatting the CD and starting again. You can write to a CDR multiple times, but you cannot overwrite areas of the disc that have already been written to.

CDR speeds are shown in a format like 4x24: The first value is the record speed, and the second value is the read speed. Each value is multiplied by the 150 KBps to calculate the record and read speed. CDRW displays three values to indicate the speed of the device: write speed, rewrite speed, and read speed – for example, 4x4x24

3. DVD Drive

Digital versatile discs (DVDs) are similar to CDs in the sense that they are another type of optical storage, but DVDs store a lot more data. The typical DVD stores 4.7GB of data. Some DVDs can store data on both sides of the disk, and newer DVDs even store data on different layers on the DVD. This allows the DVD to store more than the 4.7GB, depending upon the DVD standard.

The transfer rates of DVDs are measured in a similar fashion to CD-ROMs but the transfer rate is 1.35 MBps for each times (x). For example, if you have a 2x DVD-ROM, it has a transfer rate of 2.70 MBps. An 8x DVD-ROM has a transfer rate of 10.80 MBps

4. DVD Drive

Different types of writeable DVDs are DVDR and DVDRW. The difference between them is that you can write to DVDR only once, but you can reuse a DVDRW many times by reformatting the DVD and starting again. You can write to a DVDR multiple times, but you cannot overwrite areas of the disc that have already been written to.

| Standard | Specifications | Total Storage Space |
|----------|----------------------------|---------------------|
| DVD-5 | Single-sided, single layer | 4.7GB |
| DVD-9 | Single-sided, double layer | 8.5GB |
| DVD-10 | Double-sided, single layer | 9.4GB |
| DVD-18 | Double-sided, double layer | 17GB |

5. Combo Drive

Combo Drive is the Combination drive of CD-ROM/CD-RW/DVD-ROM, Which allows to user to read CDs, DVDs and write CDR/CDRW disc.

6. Super Drive / Multi Drive

Super Drive is also known as Multi Drive or Multi DVD Recorder. Super drive is also Combination Drive, Combination of CD-ROM/CD-RW/DVD-ROM/DVD-RW, Which allows to user to read, write CDs and DVDs.

7. Blu-ray Drive

Blu-ray Drive is popular items today in the video world because they offer the capabilities of high-definition (HD) video. Blu-ray has much better quality than DVD. Blu-ray, created by Sony, was named after the fact that a blue laser is used to read and write to the Blu-ray disc. (DVDs use a red laser.) Not only does Blu-ray offer HD video, but it also stores more information than a DVD. Blu-ray discs can store up to 25GB of data for a single-layer disc, but can store up to 50GB of data for a double-layer disc!

Blu-ray discs also have a faster transfer rate than DVDs. DVD speeds could be calculated by taking the speed indicated and multiplying it by 1.35 MBps, but a Blu-ray disc has a multiplier of 4.5 MBps! To compare, an 8x DVD has a transfer rate of 10.80 MBps, but an 8x Blu-ray disc has a transfer rate of 36 MBps!

5. Expansion Cards / Interface Cards and Devices

The expansion card (also expansion board, adapter card or accessory card) in computing is a printed circuit board that can be inserted into an expansion slot of a computer motherboard to add additional functionality to a computer system. One edge of the expansion card holds the contacts (the edge connector) that fit exactly into the slot. They establish the electrical contact between the electronics (mostly integrated circuits) on the card and on the motherboard.

a. Video Graphics Array / Adapter (VGA) / Display Adapters / Card

Graphics Adapters is an expansion card whose function is to generate and output images to a display. Many video cards offer added functions, such as accelerated rendering of 3D scenes and 2D graphics, video capture, TV-tuner adapter, MPEG-2/MPEG-4 decoding, FireWire, light pen, TV output, or the ability to connect multiple monitors (multi-monitor). Other modern high performance video cards are used for more graphically demanding purposes, such as PC games.

A Graphics Adapters the interface between the monitor and the computer – is responsible for converting the digital data from the computer into analog information. The data is converted to an analog signal before being delivered to a monitor because monitors use analog data to create the image.

Video hardware can be integrated on the motherboard, often occurring with early machines. In this configuration it is sometimes referred to as a video controller or graphics controller.

Because display functions are very time and memory-consuming, most video adapters these days have their own processing chip and memory to alleviate the processing workload from the CPU. Today's video adapters are typically PCIe or AGP cards, but you might run into some older systems that require a PCI video card because these systems don't have an AGP or a PCIe slot.



Graphics processing unit (GPU)

A GPU is a dedicated processor optimized for accelerating graphics. The processor is designed specifically to perform floating-point calculations, which are fundamental to 3D graphics rendering. The main attributes of the GPU are the core clock frequency, which typically ranges from 250 MHz to 4 GHz and the number of pipelines (vertex and fragment shaders), which translate a 3D image characterized by vertices and lines into a 2D image formed by pixels.

Video BIOS

The video BIOS or firmware contains the basic program, which is usually hidden, that runs the video card's operations and provides the instructions that allow the computer and software to interact with the card. It may contain information on the memory timing, operating speeds and voltages of the graphics processor, RAM, and other information. It is sometimes possible to change the BIOS (e.g. to enable factory-locked settings for higher performance).

Video memory

The memory capacity of most modern video cards ranges from 128 MB to 4 GB, though very few cards actually go over 1 GB. Since video memory needs to be accessed by the GPU and the display circuitry, it often uses special high-speed or multi-port memory; the video memory was typically based on DDR technology. During and after that year, manufacturers moved towards DDR2, GDDR3, GDDR4, and even GDDR5 utilized most notably by the ATI Radeon HD 4870. The effective memory clock rate in modern cards is generally between 400 MHz and 3.8 GHz.

Video memory may be used for storing other data as well as the screen image, such as the Z-buffer, which manages the depth coordinates in 3D graphics, textures, vertex buffers, and compiled shader programs.

| Type | Memory clock rate (MHz) | Bandwidth (GB/s) |
|-------|-------------------------|------------------|
| DDR | 166 - 950 | 1.2 - 30.4 |
| DDR2 | 533 - 1000 | 8.5 - 16 |
| GDDR3 | 700 - 2400 | 5.6 - 156.6 |
| GDDR4 | 2000 - 3600 | 128 - 200 |
| GDDR5 | 3400 - 5600 | 130 - 230 |

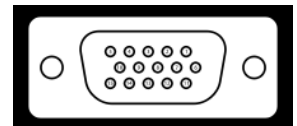
i. Outputs



9-pin VIVO for S-Video (TV-out), DVI for HDTV, and DE-15 for VGA outputs.

Video Graphics Array (VGA) (DE-15)

Analog-based standard adopted in the late 1980s designed for CRT displays, also called VGA connector. Some problems of this standard are electrical noise, image distortion and sampling error evaluating pixels.



Digital Visual Interface (DVI)

Digital-based standard designed for displays such as flat-panel displays (LCDs, plasma screens, wide high-definition television displays) and video projectors. It avoids image distortion and electrical noise, corresponding each pixel from the computer to a display pixel, using its native resolution.



Video In Video Out (VIVO) for S-Video, Composite video and Component Video

Included to allow the connection with televisions, DVD players, video recorders and video game consoles. They often come in two 9-pin Mini-DIN connector variations, and the VIVO splitter cable generally comes with either 4 connectors (S-Video in and out + composite video in and out), or 6 connectors (S-Video in and out + component PB out + component PR out + component Y out [also composite out] + composite in).



High-Definition Multimedia Interface (HDMI)

An advanced digital audio/video interconnect released in 2003 and is commonly used to connect game consoles and DVD players to a display. HDMI supports copy protection through HDCP.

ii. Types

Monochrome Display Adapter (MDA): Displays data in a text format with a single color – white text on the black screen, this standard is pretty much obsolete, but you might encounter an old server that still uses it.

Color Graphics Adapter (CGA): The next step above MDA; supports four colors in a 320 x 200 resolution but supports only two colors with a resolution of 640 x 200. CGA video adapters were the first adapters to support color.

Enhanced Graphics Adapter (EGA): The next step after CGA; much improved over the CGA graphics standard. EGA supports 16 colors at 640 x 350 resolutions.

Video Graphics Array / Adapter (VGA): Video graphics standard that allows for a resolution of 640 x 480 with 16 colors, but also supports 256 colors at lower resolutions.

Extended Graphics Array (XGA): Graphics standard that supports resolution of 800 x 600 with 65,536 colors, or a resolution of 1024 x 768 with 256 colors, there are many different spin-offs of the XGA video standard, including Wide XGA (1366 x 768), XGA+ (1152 x 864), and Wide XGA+ (1440 x 900).

Super VGA (SVGA): Supports 16 million colors at resolutions as high as 1280 x 1024; a popular graphics standard for many years.

Super XGA+: A popular video standard for LCD displays on laptop computers supporting a resolution of 1400 x 1050. The widescreen version (WSXGA+) supports a resolution of 1680 x 1050.

Ultra XGA: Supports resolution of 1600 x 1200; the video standard for 20-inch or 21-inch LCD displays on laptop computers.

WUXGA: Widescreen Ultra Extended Graphics Array (WUXGA) supports a resolution of 1920 x 1200 and is the widescreen version of the UXGA standard. This video standard is popular with widescreen LCD televisions and computer monitors.

iii. Accelerated / Advanced Graphics Port (AGP)

The Accelerated Graphics Port is a high-speed point-to-point channel for attaching a video card to a computer's motherboard, primarily to assist in the acceleration of 3D computer graphics. Since 2004, AGP has been progressively phased out in favor of PCI Express. As of mid-2009, PCIe cards dominate the market, but new AGP cards and motherboards are still available for purchase.

iv. PCI Express

PCI Express (Peripheral Component Interconnect Express), officially abbreviated as PCI-E, is a computer expansion card standard designed to replace the older PCI, PCI-X, and AGP standards. PCI-E 2.1 is the latest standard for expansion cards that is available on mainstream personal computers.

PCI Express is used in consumer, server, and industrial applications, as a motherboard-level interconnect and as an expansion card interface for add-in boards. A key difference between PCI-E and earlier buses are a topology based on point-to-point serial links, rather than shared parallel bus architecture.



b. Sound Card

Another very popular output device is the sound card. As an output device, the sound card is responsible for sending sound data to the speakers, but can also be used as an input device by lining-in an external source to the card. For example, you could line-in a stereo system through your sound card and convert some old audio tapes to MP3 files.

The sound card contains a DAC that converts the digital data from the computer into analog signals that create the sound. The sound card has a number of ports on the back that allow you to connect both output devices and input devices:

Line-in: The Line-in port is used to connect your CD player or stereo system and use it as a source for what the sound card plays. A great idea to get your old tapes to MP3 format!

Mic: Connect a microphone, which acts as a source for information being recorded.

Headphones: Connect your headphones.

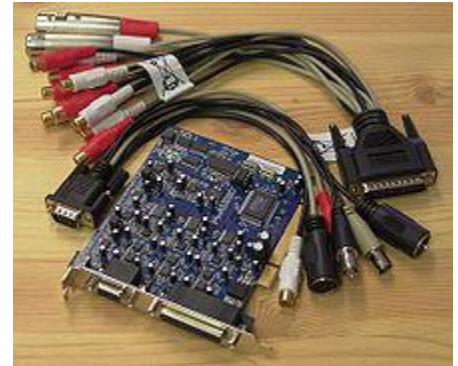
Line-out: Just like you can connect your stereo to the computer via the Line-in port, you can also take sound on the computer and “line it out” to the stereo.

| Color | Function | Connector |
|------------|------------------------------------------------------------------------------|------------|
| Pink | Analog microphone audio input | 3.5 mm TRS |
| Light Blue | Analog line level audio input | 3.5 mm TRS |
| Lime green | Analog line level audio output for the main stereo signal | 3.5 mm TRS |
| Brown/Dark | Analog line level audio output for a special panning, Right-to-left speaker | 3.5 mm TRS |
| Black | Analog line level audio output for surround speakers, typically rear stereo. | 3.5 mm TRS |
| Orange | Analog line level audio output for center channel speaker and subwoofer | 3.5 mm TRS |



Professional soundcards

Professional soundcards are special soundcards optimized for real time Multi-channel sound recording and playback, including studio-grade fidelity. Their drivers usually follow the Audio Stream Input Output protocol for use with professional sound engineering and music software, although ASIO drivers are also available for a range of consumer-grade soundcards.



USB Sound Cards

USB Sound Cards are actually external boxes that plug into the computer via USB. They are more accurately called audio interfaces rather than sound cards. The USB specification defines a standard interface, the USB audio device class, allowing a single driver to work with the various USB sound devices on the market. Cards meeting the USB 2.0 specification have sufficient data transfer capacity to support high quality sound operation if their circuit designs permits.

a standard interface, the USB



PCMCIA Sound Cards

Soundcards using the PCMCIA Card Bus interface were popular in the early days of portable computing when laptops and notebooks did not have onboard sound. Even today, while rare, these card bus audio solutions are still used in some setups in which the onboard sound solution of the notebook or laptop is not up to par with the owners' expectations or requirements, and are particularly targeted at mobile DJs, with units providing separated outputs usually allow both playback and monitoring from one system.



Integrated Sound Card

In the late 1990s, many computer manufacturers began to replace plug-in soundcards with a Codec Chip integrated into the motherboard. Many of these used Intel's AC97 specification. Others used inexpensive ACR slot accessory cards.

c. Local Area Network Card

A Local Area Network Card (LAN), Network Interface Card/Controller (NIC), Ethernet Card or Network Adapter is a computer hardware component designed to allow computers to communicate over a computer network. It provides physical access to a networking medium and provides a low-level addressing system through the use of MAC addresses. It allows users to connect to each other either by using cables or wirelessly.

Every Ethernet network card has a unique 48-bit serial number called a MAC address, which is stored in ROM carried on the card. Every computer on an Ethernet network must have a card with a unique MAC address. Normally it is safe to assume that no two network cards will share the same address,

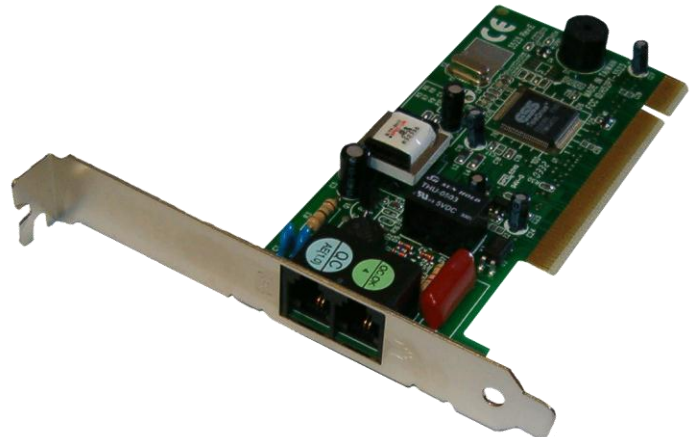


because card vendors purchase blocks of addresses from the Institute of Electrical and Electronics Engineers (IEEE) and assign a unique address to each card at the time of manufacture.

Today a network card typically has a RJ45, where the network cable is connected, and a few LEDs to inform the user of whether the network is active, and whether or not there is data being transmitted on it. Network cards are typically available in 10/100/1000 Mbps varieties. This means they can support a notional maximum transfer rate of 10, 100 or 1000 Megabits per second.

d. Fax Modem Card

A modem (modulator-demodulator) is a device that modulates an analog carrier signal to encode digital information, and also demodulates such a carrier signal to decode the transmitted information. The goal is to produce a signal that can be transmitted easily and decoded to reproduce the original digital data. Modems can be used over any means of transmitting analog signals, from driven diodes to radio. The most familiar example is a voice band modem that turns the digital data of a personal computer into analog audio signals that can be transmitted over a telephone line, and once received on the other side, a modem converts the analog data back into digital. Modems are generally classified by the amount of data they can send in a given time, normally measured in bits per second bps.



e. TV Tuner Card

A TV tuner card is a computer component that allows television signals to be received by a computer. Most TV tuners also function as video capture cards, allowing them to record television programs onto a hard disk.

The interfaces for TV tuner cards are most commonly either PCI bus expansion card or the newer PCI Express (PCIe) bus for many modern cards, but PCMCIA, Express Card, or USB devices also exist.



f. Wireless LAN / WiFi (Wireless Facility)

A wireless local area network (WLAN) links devices via a wireless distribution method and usually provides a connection through an access point to the wider internet. This gives users the mobility to move around within a local coverage area and still be connected to the network. Wireless LANs have become popular in the home due to ease of installation and the increasing popularity of laptop computers. Public businesses such as coffee shops and malls have begun to offer wireless access to their customers, sometimes for free.



Peer-to-Peer

A peer-to-peer (P2P) network allows wireless devices to directly communicate with each other. Wireless devices within range of each other can discover and communicate directly without involving central access points. This method is typically used by two computers so that they can connect to each other to form a network.

Bridge

A bridge can be used to connect networks, typically of different types. A wireless Ethernet bridge allows the connection of devices on a wired Ethernet network to a wireless network. The bridge acts as the connection point to the Wireless LAN.

Wireless distribution system

A Wireless Distribution System is a system that enables the wireless interconnection of access points in an IEEE 802.11 network. It allows a wireless network to be expanded using multiple access points without the need for a wired backbone to link them, as is traditionally required.

g. Bluetooth

Bluetooth is a proprietary open wireless technology standard for exchanging data over short distances (using short length radio waves) from fixed and mobile devices, creating personal area networks (PANs) with high levels of security. Invented by telecoms vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization. Today Bluetooth is managed by the Bluetooth Special Interest Group. Bluetooth provides a secure way to connect and exchange information between devices such as faxes, mobile phones, telephones, laptops, personal computers, printers, Global Positioning System (GPS) receivers, digital cameras, and video game consoles.



h. Media / Memory Card Reader

A memory card reader is a device used for communication with a smart card or a flash memory card. A business card reader is a scanning device used to scan and electronically save business cards. A magnetic card reader is a device used to scan cards containing magnetic data strips.

A smart card reader is an electronic device that reads smart cards. Some keyboards have a built-in card reader. Some laptops have built-in smart card reader. A memory card reader is a device, typically having a USB interface, for accessing the data on a memory card such as a Compact Flash (CF), Secure Digital (SD) or Multi Media Card (MMC). Most card readers also offer write capability.



i. USB Interface Card / USB Hub

A USB Interface Card or USB Hub is a device that expands a single USB port into several so that there are more ports available to connect devices to a host system. USB hubs are often built into equipment such as computers, keyboards, monitors, or printers.



Laptop computers may be ready with many USB ports, but an external USB hub can consolidate several everyday devices (like a mouse and a printer) into a single hub to enable one-step attachment and removal of all the devices.

j. Express and PCMCIA Card

The Express Card is an interface to allow peripheral devices to be connected to a computer. The Express Card standard is implemented as one or more slots built into, usually in Laptop, and cards to be inserted into a slot and containing electronic circuitry and connectors to which external devices can be connected. The Express Card standard replaces the PC card (also known as PCMCIA or Card Bus) standards. Express Card plug-in hardware available includes TV tuners, mobile broadband cards, FireWire 800 (1394B), Serial ATA external disk drives, wireless network interface cards and soundcards. Media remote control units are available that use the Express Card slot to store and recharge.

PCMCIA Card

The Personal Computer Memory Card International Association (PCMCIA) developed both the Express Card standard and the PC Card standards. The host device supports both PCI Express and USB 2.0 connectivity through the Express Card slot. In computing, PC Card (originally PCMCIA Card) is the form factor of a peripheral interface designed for laptop computers. The PC Card standard (as well as its successor Express Card) was defined and developed by a group of industry-leading companies called the Personal Computer Memory Card International Association (PCMCIA).

All PC Card devices use an identical 68 pin dual row connecting interface. All are 85.6 mm long and 54.0 mm wide. This is the same size as a credit card. The original standard was defined for both 5 volt and 3.3 volt cards. Some cards and some slots operate at both voltages as needed. The original standard was built around an 'enhanced' 16-bit ISA bus platform.



6. Power Supply units (PSU)

The power supply usually takes 120V or 240V of AC and supplies the power to computer components by converting into 3.3V, 5V, or 12V of DC. You should learn four terms that deal with power in computer systems:

- Volt
- Ohm
- Amp
- Watt

Electrical current flows with the same principles that are used when water flows, so water is often used as a similarity for electrical current.

Volt

A technical definition of a volt is a unit of electrical potential difference or the potential difference across a conductor when a current of one ampere dissipates one watt of power. In water terminology, voltage is represented by the pressure that is the water supply tank. This is a potential because unless you provide an exit path for water to leave the tank, this potential is not realized. If you increase the pressure in the tank, you increase the potential to supply water or power.

Ohm

An ohm is a measure of resistance or electrical impedance. When comparing electricity with water, resistance is determined by the size or diameter of the hose or pipe that is used to supply water, where a smaller hose produces more resistance.

Amp

An ampere (amp) is a unit of electric current or the measure of electrical flow. When referring to water, it is also the rate of water flow. There is a direct relationship between volts, resistance, and current: If you reduce resistance or increase voltage, you increase the current. This relationship – Ohm's Law – is represented by this formula:

$$I = V / R$$

Where I is current (amps), V is voltage (volts), and R is resistance (ohms).

Watt

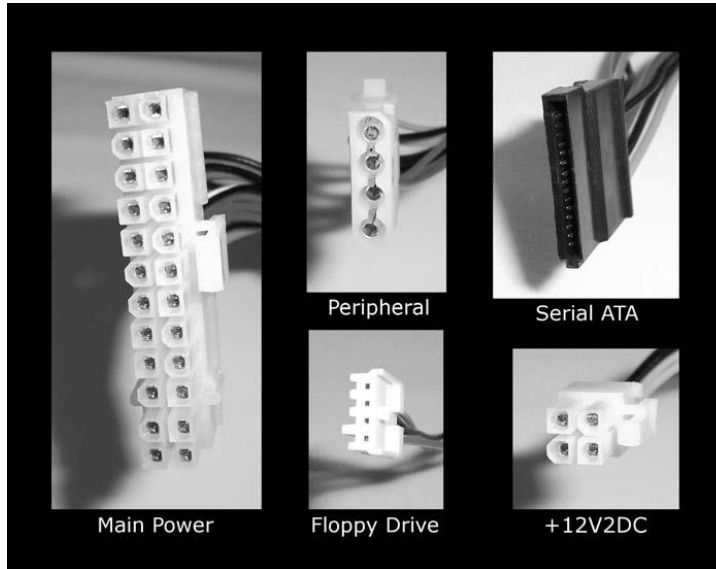
The technical definition of a watt is that it is a unit of power, equal to one joule per second. If you equate this to water again, watts have you use flowing water do something. If this water runs over a waterwheel, watts are the measure of how fast the wheel can be turned by the water. If you increase the current, the wheel is able to turn faster. The formula to calculate watts is

$$P = V \times I$$

Where P is power (watts), V is voltage (volts), and I is current (amps).

Identifying Power Supplies

The most common type of motherboard that you will have to provide power to will be some form factor of the ATX because common power supply compatible with an ATX motherboard will be required. The current version of the ATX specification is 2.2. The biggest difference between the versions 1.3 ATX specification and the 2.x ATX specifications is the use of a 24-pin main power connector used in the 2.x ATX specification, rather than a 20-pin connector under the 1.3 ATX specifications.



Outside Central Processing Unit

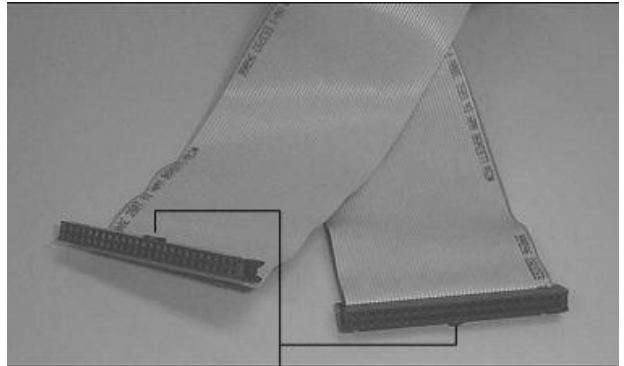
Types of Cable

This section will explain different types of cables and the uses of each type. Some of the cables are used inside your computer called internal and others are external. After completing this section, you should be able to identify the basic types of cables and where they are used.

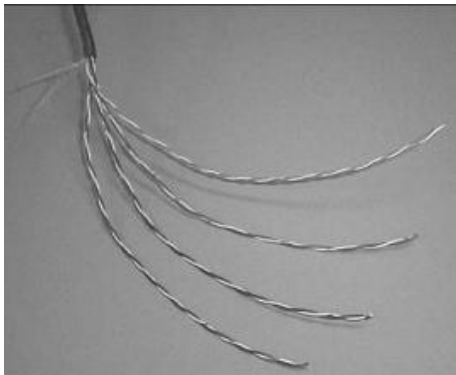
Ribbon

Ribbon cables are often used to connect components inside a computer, such as hard disk drives and floppy disk drives. They are made up of several wires laid out parallel to each other in such a way that they resemble a ribbon.

Note the small tab halfway down the edge of the black connector: This tab matches a groove on the device that it is attached to.



Small tabs



Twisted pair

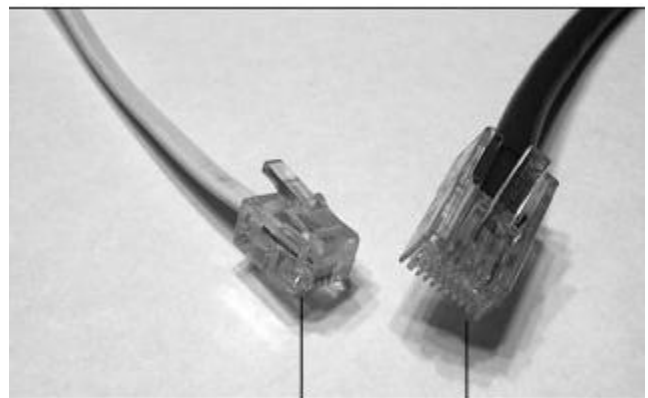
Twisted pair cables consist of three or four pairs of wires. The grading level is based on how the wires are arranged inside the cable, rather than the number of wires.

RJ-11

RJ short for registered jack — has small modular connectors that clip into matching holes. The RJ-11 connector is a standard modular connector used for telephones. It accepts four wires, usually in the form of a flat cable, rather than twisted pair cable. Analog telephone service is usually carried only on the two middle wires. You should see a female portion of this connector on your modem.

RJ-45

The RJ-45 usually accepts eight wires (four pair). This connector is used for 10BaseT, 10BaseTX, and token ring networking. Officially, the RJ-45 connector was designed for voice grade circuits, and what is now referred to as the RJ-45 is officially known as an 8-pin connector.

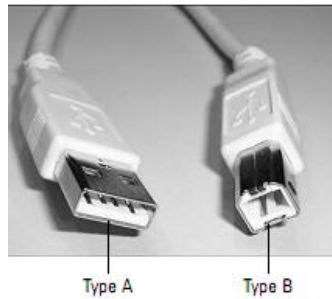


RJ-11

RJ-45

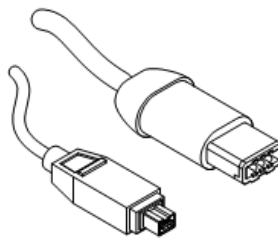
Universal Serial Bus (USB) connectors

USB 1.0 and USB 2.0 both use proprietary connectors to connect as many as 127 devices. The two main types of connectors in USB are Type A for hosts and Type B for devices.



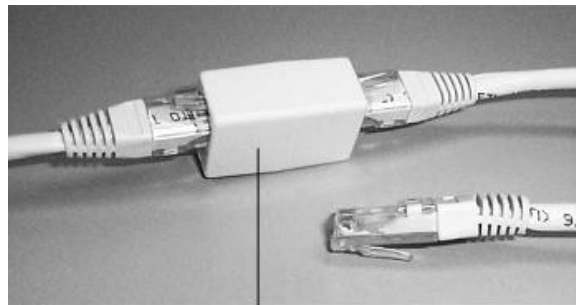
IEEE 1394 (FireWire) connectors

FireWire is an Apple Computer trademark for devices that match the IEEE 1394 specification. This specification allows 63 devices (without hubs) to be connected in a single bus. It also uses a proprietary connector, similar in size to the USB connector but with a different shape.



Barrel Connectors

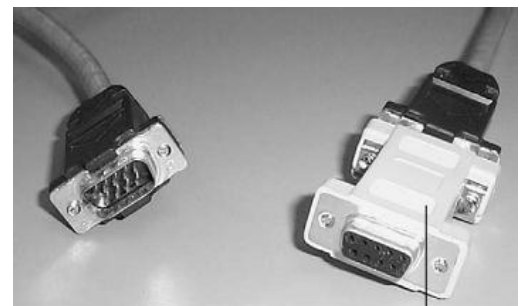
The term barrel connectors comes from Thinnet networking, where cables could be extended by means of an adapter, resembling a small barrel, that accepted a male connector on either end. This term is now often applied to any connector that extends the length of a cable by joining two cables but that does not change the pin configuration.



Barrel connector

Gender changers

They are straight-through connectors that don't change the order or connection of the pins; they only change the type of the connector that they are attached to. They look like a connector that has either two male or two female ends; when attached to a cable of one type the connector becomes the other. These are used only in rare cases where your cables have the wrong type connector, which is a situation that I often encounter with video connectors when working with KVM (Keyboard, Video, and Mouse) switches and cables made by different manufacturers.



Gender changer

Ch. 2 Assembling a Computer & Hardware Installation

Unpack the computer case, discard its plastic wrap. Unscrew the big screws on the back of the case. Pull on the side latch to open the case. Find a replacement face plate.



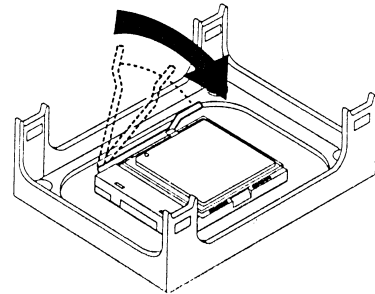
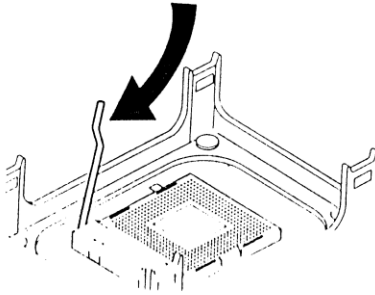
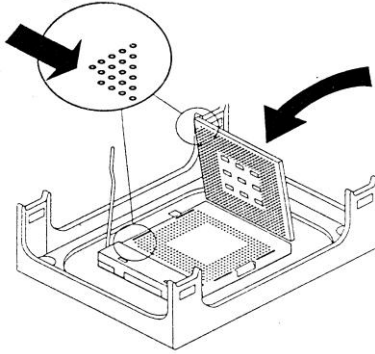
Take the motherboard out of its box, and lay it on a non-metallic flat surface, such as a wooden table.

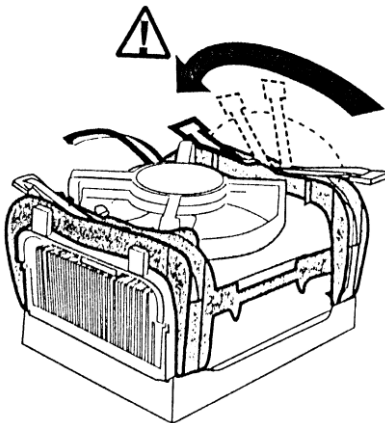
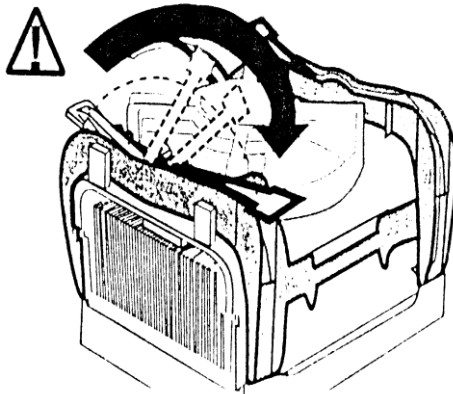
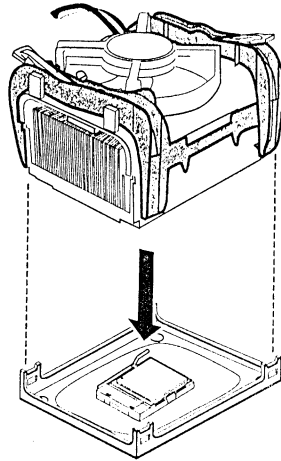
Unpack the DIMM. Push apart the two white DIMM holders on the ends of the blue DIMM slot on the motherboard, Push the DIMM solidly into the blue DIMM slot.

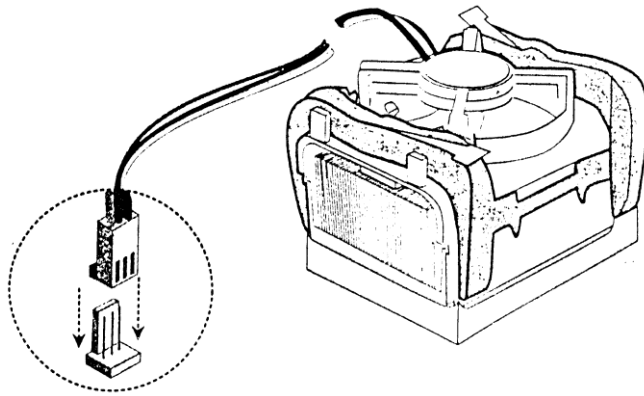
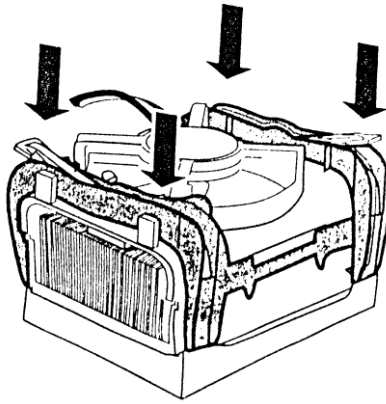
Pull the CPU-socket locking lever slightly out, then up to vertical, take the CPU out of its plastic container, Put the CPU into the CPU socket, with the CPU triangle on top of the triangle marked on the motherboard; opposite corner from the lever. When the CPU is aligned properly with the socket, push the CPU-socket locking lever back to its original position. Take the plastic cover off the Heatsink. Attach the plug into the three pins at the edge of the motherboard for CPU fan.



Installing LGA Processor and Cooling Fan







Lay the case flat on its side, put the motherboard gently into the case, slide the motherboard towards the edge of the case. Screw nine small Phillips-head screws into the nine holes. Don't overtighten. The case has several slots for expansion cards, each slot covered by a plate. Unscrew the second plate from the top. Plug in expansion card, and screw it.



Change the hard drive jumper from Cable Selected to Master. Slide the hard drive into the middle of the 3.5" drive cage, slightly more than halfway, so that two of its screw holes are visible. Screw the hard drive into the drive cage.

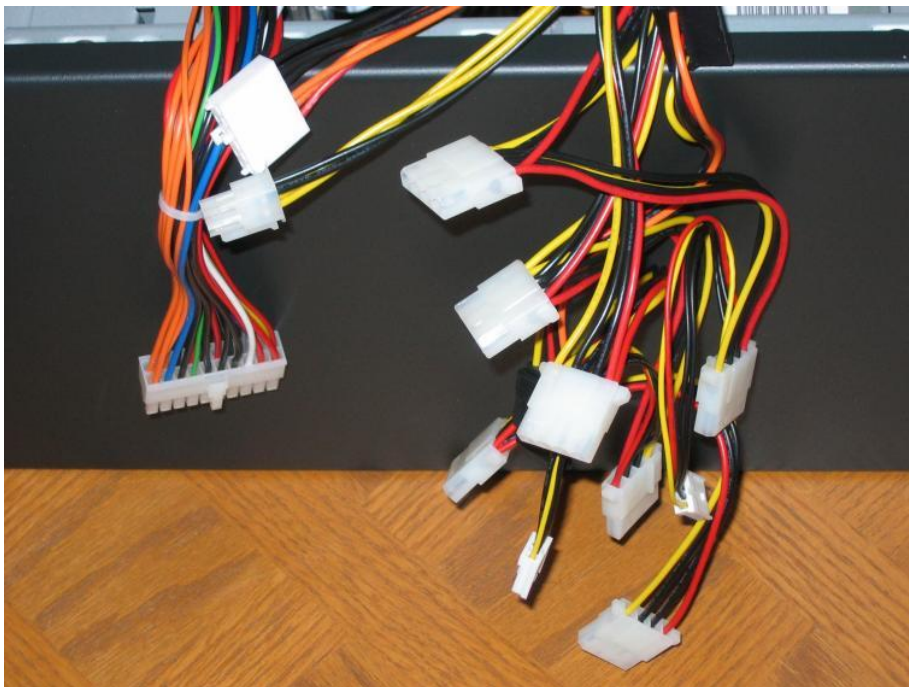


Push the top side buttons on the case to release the top front of the case, Take the front off, slide the DVD-ROM drive into the case from the front until it snaps into place and change the CD/DVD-ROM jumper from Slave or Master.

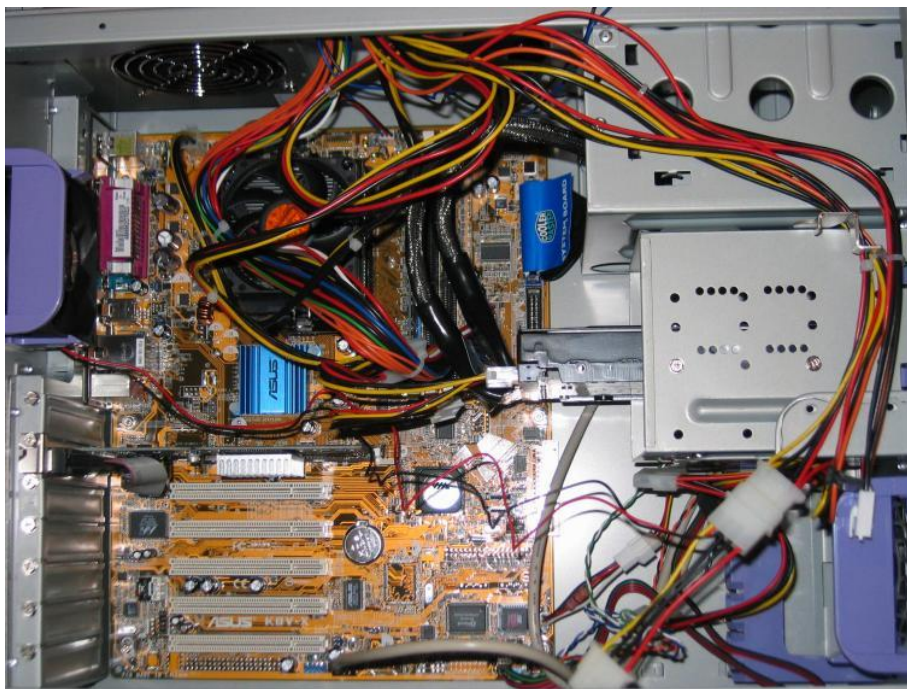
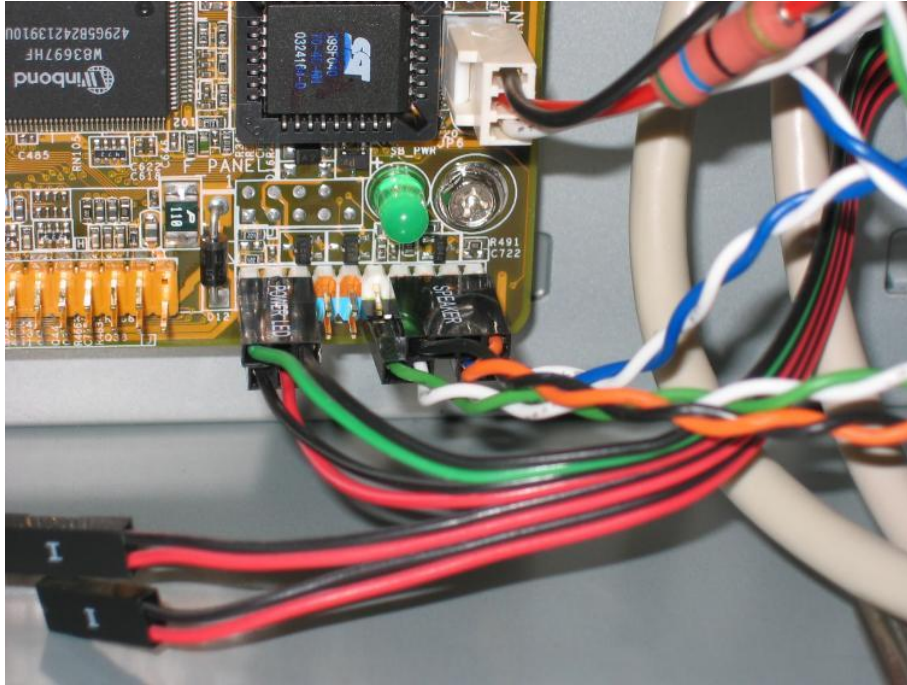
The top position is bad for two reasons: first, it doesn't give heat from the DVD-ROM drive any room to rise; second, the nice IDE cable won't reach from the hard drive to the top position.

Hard Disk Jumper Setting

There might be two setting for a Hard Disk and Optical Devices, Master and Slave. The first set of pins from IDE connector side which is like is used for Master and the second is used for slave. This setting is used both for optical devices like CD-ROM and as well as Hard disk.



Plug the Front Panel Reset Switch, Power Switch, HDD LED, Power LED, and Speaker connectors into the motherboard. Plug the USB Front Panel into the motherboard, if available.



Turn the power switch on. Watch the CPU fan, and press the front power button on the case. If the CPU fan doesn't start spinning, turn power off immediately; you have a problem.

If the computer doesn't beep within thirty seconds, turn power off; you have a problem.

If the CPU fan starts spinning and the computer beeps, turn power off; you have a working computer. Put the side of the case back on.

Ch. 3 - Understanding BIOS Setup

Now, your new PC should be up and running and you should be staring at the BIOS setup screen. Your next step is to make sure your BIOS is using the proper settings. Remember at this point we are most interested in getting this PC to work. When you get into CMOS for the first time, do the following:

1. Go into your Standard CMOS Setup screen. You will see settings for IDE Primary/Secondary Master/Slave. If these items are not already properly set for the hardware you have, have the BIOS auto-detect your drives for you. Also, set the date and time to the correct settings.

2. Confirm your boot order. One of the screens in your CMOS (many times the Advanced Features screen) will have a boot order option. This controls the order in which the PC will look for a copy of something to boot off of, whether it is a full operating system or just a diskette or CD. In a little bit you will be installing your full operating system and will need to boot the system earlier. If you are using a standard system diskette, make sure A: (or your floppy) is enabled to be first in line. In this case, you might want to also check to be sure that if there is a setting to disable seeking out the floppy in total, that is set to indeed seek out the floppy drive (some people set this to off so as to make the boot process faster, but you cannot do that while building). If you are going to be booting from a CD (as is probably the case if you will be installing Windows XP) then make sure your CD-ROM is first in line.

Those are the basics of what you will need to set in order to continue with this chapter and have your PC set properly. Now, I will give a brief rundown of some of the other settings you may see. This is by no means meant to be a complete reference, as all boards are different. Your motherboard's manual is your best reference to the settings you need to concern yourself with.

Once you are in the BIOS setup utility, you will see a variety of many options, arranged in a two column format. At the top of the screen will be a title which tells you are in the setup utility. It will also indicate the brand of BIOS you have, whether it is Award, Phoenix, AMI BIOS, etc. At the bottom of the screen will be the key legend that tells you how to navigate around your BIOS with your keyboard. While there are BIOS editions out there that allow you to use a mouse, most do not and you have to navigate with your keyboard only. Here is a typical mapping of keys and their functions:

| Function | Command |
|-----------|---------------------------------|
| F1 | General Help |
| F5 | Previous Values |
| F6 | Load Fail-Safe Defaults |
| F7 | Load Optimized Defaults |
| F10 | Save |
| ESC | Exit |
| ENTER | Select |
| +/- PU/PD | Value |
| F1 | IBM - Entering BIOS Setup |
| F10 | Compaq - Entering BIOS Setup |
| F2, Del | Intel, Dell and Other Companies |

| | |
|--------------|------------|
| F11 / F12 | Quick Boot |
| F8 | Safe Mode |
| Ctrl+Alt+Del | Restart |

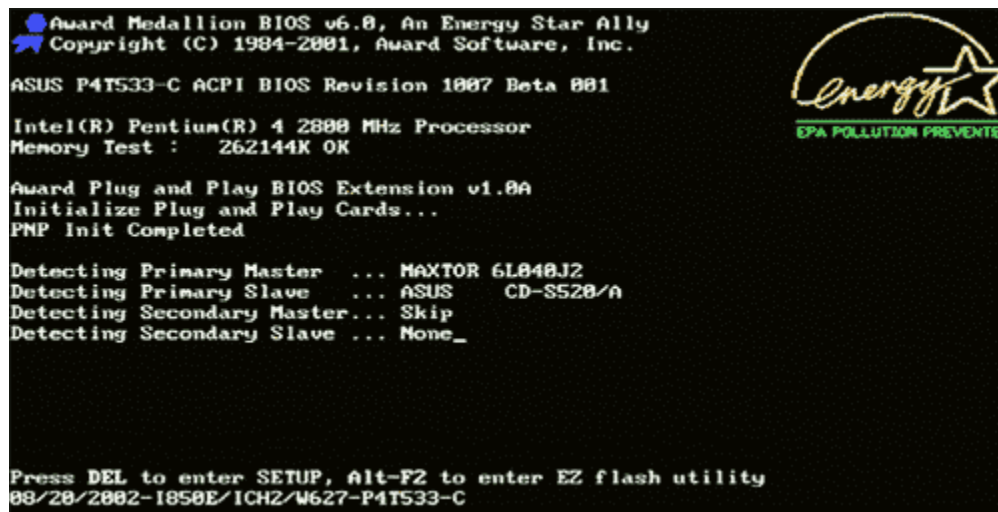
The up and down arrow keys are used to move up and down, side to side on the menu options on the screen. Some of the functions in the table above also have corresponding entries in the main menu. F10 does the same thing as the "Save & Exit Setup" option, for example. You can also exit BIOS without saving.

Entering BIOS Setup

To enter the CMOS Setup, you must press a certain key or combination of keys during the initial startup sequence. Most systems use "Esc, Del, F1, F2, Ctrl+Esc or Ctrl+Alt+Esc" to enter setup. There is usually a line of text at the bottom of the display that tells you "Press __ to Enter Setup."

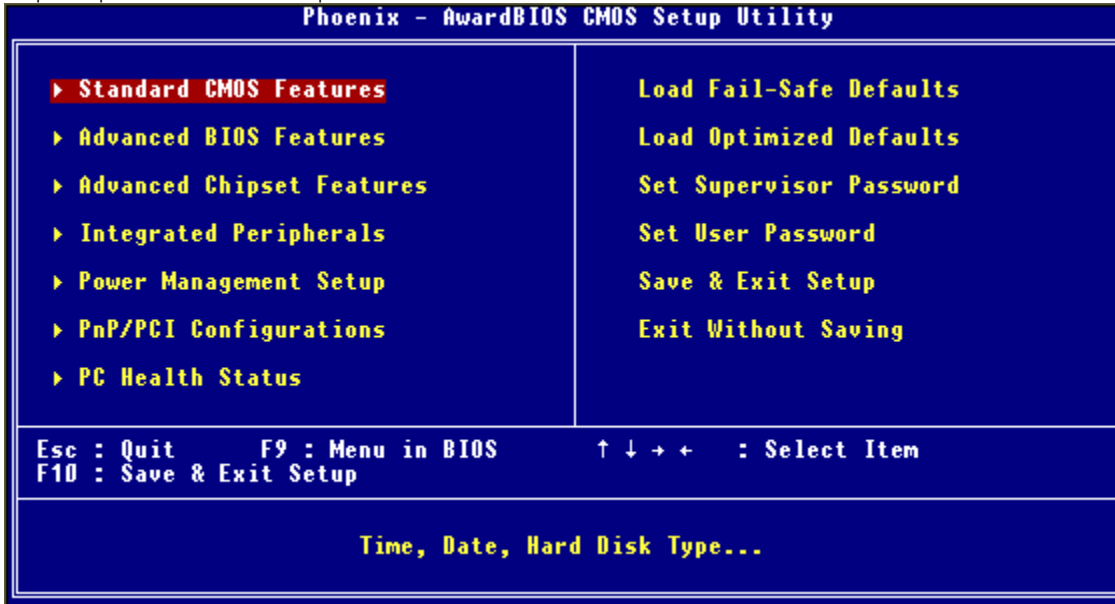
Be careful when making changes to setup. Incorrect settings may keep your computer from booting. When you are finished with your changes, you should choose "Save Changes" and exit. The BIOS will then restart your computer so that the new settings take effect.

The BIOS uses CMOS technology to save any changes made to the computer's settings. With this technology, a small lithium battery can supply enough power to keep the data for years. In fact, some of the newer chips have a 10-year, tiny lithium battery built right into the CMOS chip!



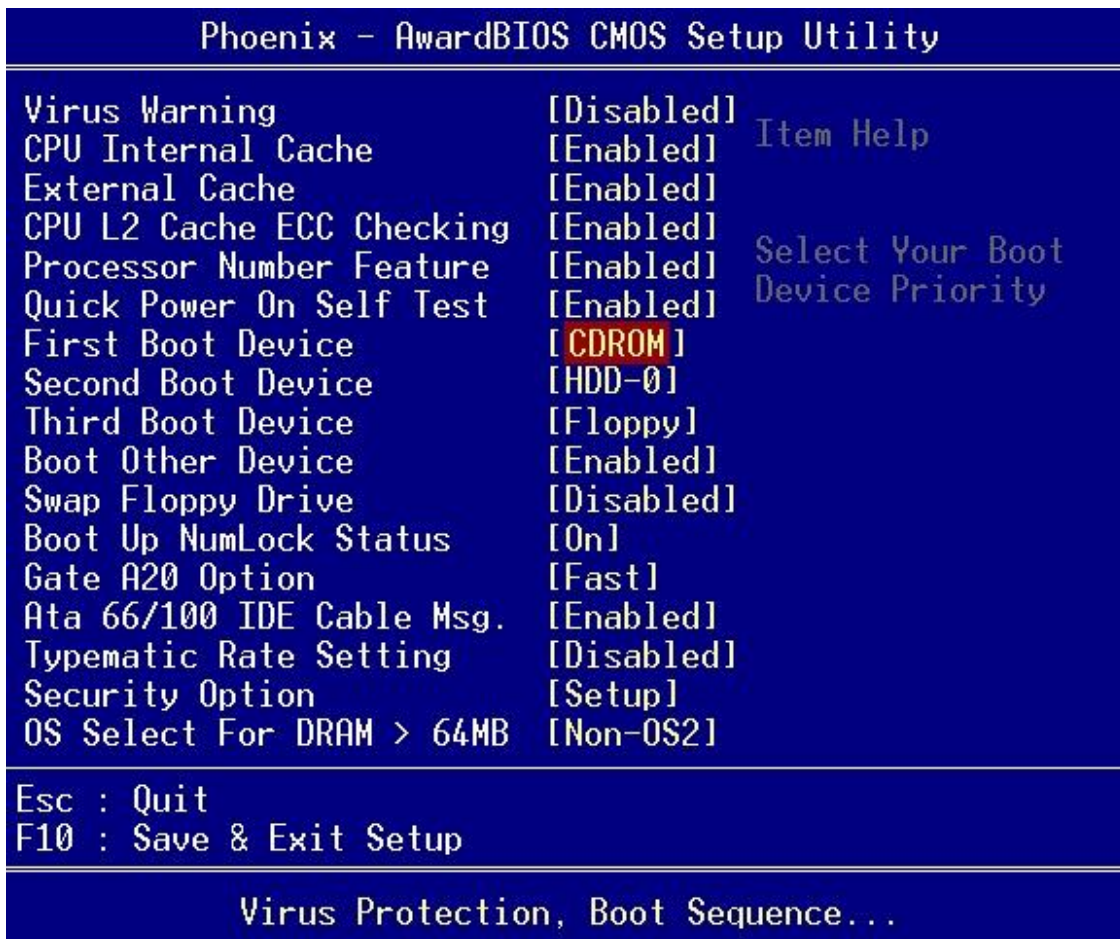
Once you have entered setup, you will see a set of text screens with a number of options. Some of these are standard, while others vary according to the BIOS manufacturer. Common options include:

1. Adjust date and time
2. Adjust Boot Option
3. Power Management
4. Password Protection
5. Check Configuration
6. Control Internal Devices
7. IDE /SATA Devices Detection
8. Exit - Save / discard your changes, or restore default settings.



1. Advanced BIOS Features

This section controls some of basic settings of PC. For example, you will enable/disable things such as on-board cache, determine the boot device, etc. Here are some of the common settings:



Virus Protection/Warning

Will scan your hard drive boot sector on startup for viruses and alarm you if anything attempts to write to the boot sector. Enable for increased security, but disable to avoid the annoyance. If you are using a third-party antivirus utility (or plan to) then this is useless.

Cache Settings

These settings control L1 and L2 cache, which in most new systems resides on the processor itself. In almost all cases, this is enabled and should be. If there is an option to have ECC error checking on the L2 cache, go ahead and have it enabled.

Quick POST

This will allow the BIOS to skip some tests such as the memory test on boot-up, so allowing the PC to boot faster. You can disable it for the sake of care, and this is fine if you leave your PC on most of the time. But, if you turn it on a lot, this is an annoyance and I'd recommend enabling Quick POST.

Boot Sequence

This controls the order in which the PC looks at the drives for bootable information. Sometimes the BIOS will have one field for this and you scroll through the options. Other versions have separate settings for "First Boot Device", "Second Boot Device" and so on.

Boot Sequence / Boot Options and Boot Priority options consist of the order in which computer is booted. A computer can be booted with the help of following devices:

- Optical Devices (CD-ROM / DVD-ROM)
- Hard Disk Drive
- Floppy Disk Drive
- USB-Flash Drive / Thumb Drive

The best booting order is as follows:

- 1st Boot Device : Optical Devices (CD-ROM / DVD-ROM)
2nd Boot Device : Hard Disk Drive (HDD / HDD-0 / IDE-0 / Hard Disk Only)

Boot Numlock

Enable to have Numlock on when you start the computer.

HDD SMART Capability

Set to disabled. It is only useful if you have software running which monitors the status of the hard drives.

2. Power Management

This section should be fairly straight-forward to even the novice user, and you should be able to use your manual to best describe the settings. I usually leave everything in here default and you should for now, too.

3. Integrated Peripherals

On-Chip PCI IDE, or IDE Controller

Used to either enable or disable either of your on-board IDE controllers. You can disable one of these if you do not need it, freeing up resources. For example, if IDE-2 is unused, you can disable it, thus freeing up IRQ 15 so something else can use it.

USB Controller

Enable or disable your motherboard's on-board USB controller.

USB Keyboard Support

Many boards have a separate setting for USB keyboards, so you will need to enable this if you use one.

USB Mouse Support

Same as keyboard, but sometimes you see one for mice, too.

Duplex Mode

This will determine full duplex or half duplex transfer modes for your IR port, if enabled.

4. PnP/PCI Configuration

This section controls some of the various aspects of plug and play and the PCI bus. Much of it will not need to be touched at this point, but a couple items bear mentioning:

PNP OS Installed

If all your operating systems support Plug & Play (PnP), select yes so that they can take over the management of device resources. If you are using a non-PnP-aware OS or not all of the operating systems you are using support PnP.

PCI/VGA Palette Snoop

This option is only useful if you use an MPEG card or an add-on card that makes use of the graphics card's Feature Connector. It corrects wrong color reproduction by "snooping" into the graphics card's frame buffer memory and modifying (synchronizing) the information delivered from the graphics card's Feature Connector to the MPEG or add-on card. It will also solve the problem of display inversion to a black screen after using the MPEG card.

5. PC Health

This page has not settings, but basically displays information based on some of the sensors on the motherboard. This information includes the CPU core temperature, the case interior temperature, the RPM speeds of the chassis fan and CPU fan, as well as voltage readouts for the processor, AGP, DDR-DRAM, etc. This information can be useful for monitoring information in high-speed situations. Monitoring voltages is also important, as it can help track down whether a piece of hardware is acting up because it has too little voltage.

6. Set Supervisor/User Password

These are ways to set BIOS-level password security for your system. When a supervisor / administrator password is enabled, a password will be required before the CMOS setup can again be entered and changed. If a user password is specified, then a user who tries to enter setup will only be able to change his own password, nothing else. When setting a supervisor password, you also set the level of security, whether you want it to only protect the BIOS Setup or if you want a password required in order to even use the system.

If you lose it, you'll have to reset your whole BIOS to get your system back, BIOS Battery is put out of the mother board and the computer is switched on.

7. Defaults Values

Many BIOS versions have pre-set sets of default values which you can pre-load. Some have “fail-safe” defaults and “optimized” defaults. If you don’t wish to mess with any of the above, you can use these options to set the BIOS info up to certain sets of settings in one or two button clicks.

8. Save and Exit

Save and Exit the BIOS setup program will save all new setting in CMOS and it will also reboot the computer.

Ch. 4 - Booting Process and MS-DOS

Booting is a process that starts operating systems when the user turns on a computer. In another words a process that computer load necessary files of operating system from storage devices to RAM, called boot process.

The Power-on Self-Test (POST) process starts when power is applied to the system. Electrical current makes its way from the power lead on the motherboard to the ROM-BIOS chips; when the current is received by the BIOS chips, they immediately begin executing their programs. One of the first checks is the memory. After the memory check, the POST process moves on to find out what ports or I/O devices exist on the system. The next thing that happens is a search for bootable disk devices. The order of this search is defined by the settings stored in CMOS memory, but is often A: (Floppy Disk), C: (First partition on the first bootable Hard Disk), USB Flash Disk and CD/DVD Drive.

For each device in the list of possible bootable devices, the partition table is checked for the active partition. Floppy disks, USB Flash Drive and the CD/DVD Drive check only the first partition. For this partition, the first sector is read and checked for a boot loader. For Windows 2000 and Windows XP, the boot loader is `ntldr`; the boot loader for Windows Vista / Windows 7 is `bootmgr`. When this file is located, it is executed. If it was not found on the first potential bootable device, the second and third devices are checked before reporting a boot failure.

The boot sector is created when the disk is formatted, and it contains a small program that has a mini file-system driver to read FAT, FAT32, and NTFS partitions. This program then looks for the real boot loader, which is `ntldr`.

The job of `ntldr` – the boot loader for Windows XP based OS – is to coordinate the loading of the rest of the OS. `ntldr` is located on the root of your system partition, and if it is corrupted, it can easily be replaced from any other working copy of a Windows XP based OS. `ntldr` then reads the `boot.ini` file, if it exists, and displays the list of possible OS that can be booted.

After choosing any version of a Windows XP based OS, `ntdetect.com` performs hardware detection, scanning all hardware ports, processor make, model, and description, and the amount of RAM on the system. After this information has been collected, it is returned to `ntldr` and will eventually make up the `HKEY_LOCAL_MACHINE\HARDWARE` key of the Registry. When formatting a floppy disk using a Windows XP based OS, the boot sector is set to look for `ntldr`. If you leave a disk in your computer when it is being rebooted, you will see this message:

```
NTLDR is Missing
Press any key to restart.
```

For disks formatted with Windows 9x, this message will appear:

```
Invalid system disk
Replace the disk, and then press any key
```

In the case of Windows Vista / 7, the boot loader is `bootmgr`. This process is used by Windows OS that have been released after Windows Vista, so it is the same process that is used by Windows 2008 Server.

1. Bootable Disc

A boot disk will allow you to boot off of a disk instead of your hard drive. This boot disk can be used to fix issues that may arise during the lifetime of your computer and to help load older MS-DOS. Keep in mind boot disk is completely different than a Startup Disk and Restore Disc that may have been included with your computer. The best type of bootable disc come with a variety of diagnostic and repair tools.

2. Startup Disc

One of the first things you should reach for when troubleshooting a Windows XP boot problem is a Windows startup disk. This disk is different from an MS-DOS startup disk. A Windows startup disk contains only the files that you must have to start the operating system with the remainder of the Windows system files installed on the hard disk drive.

3. Restore Disc / Recovery Disc

A recovery disc is a general term for media containing a backup of the original factory condition of a computer as configured by an original equipment manufacturer or an end-user. When you buy a new computer you will usually get some sort of data restore/ recovery disc. This is used to restore your operating system and software back to factory condition so your Computer will run as it did when you bought it. This is usually done by saving an image of the partition where the OS & installed programs are located. The image is saved to a single file or split into a spanned set of files if its total size exceeds FAT32's 4GB file size limitation. This guide will explain various ways to make a restore disc that you can customize to your needs. The two main methods of doing are by either storing the image on the hard disk or on a recordable disc. The advantage of storing the image to hard disk is faster speed and the flexibility of overwriting images. Norton Ghost has the option of burning images directly to CD or DVD. The downside is that it requires the user to use the bootable disc along with those discs.

4. Rescue Disc

Rescue Disc is the process of salvaging data from damaged, failed, corrupted, or inaccessible storage media when it cannot be accessed normally. Often the data are being salvaged from storage media such as hard disk drives, CDs, DVDs and other electronics Rescue Disc may be required due to physical damage to the storage device or logical damage to the file system that prevents it from being mounted by the host operating system.

5. Software Solution 2010 Rescue Disc

Having a rescue boot disc like that can be incredibly useful whether you're supporting an office full of Computers or just one. At one end of the range, it means that support staffs or IT techs can carry, on one slim disc, most or all of the software tools they need to service or set up multiple brands, types, or generations of PCs in an enterprise. Software Solution 2010 is a general all in one Disc solution including Rescue, Startup, Restore or Recovery and preconfigured Bootable Disc; it contains up to 20 DOS-based diagnostic and repair tools. It also provides read/write access to NTFS file systems, 32- and 64-bit hardware drivers, and network connectivity.

Instead, you insert a single custom CD into your drive and boot from that. That one disc contains not only the necessary files to get your PC started, but also contains everything you need to diagnose and repair almost any kind of system trouble. In fact, it's packed with whole software toolkit all in one place, right at your fingertips.

Creating Windows Startup Disk

To create a Windows startup disk, insert a floppy disk into the drive of a similarly configured, working Windows XP system, launch My Computer, right-click the floppy disk icon, and select the Format command from the context menu. When you see the Format dialog box, leave all the default settings as they are and click the Start button. Once the format operation is complete, close the Format dialog box to return to My Computer, double-click the drive C icon to access the root directory, and copy the following three files to the floppy disk:

- Boot.ini
- NTLDR
- Ntdetect.com

After you create the Windows startup disk, insert it into the floppy drive on the afflicted system and reboot the computer. When you boot from the Windows startup disk, the computer will bypass the active partition and boot files on the hard disk and attempt to start Windows XP normally.

Booting from a Thumb Drive

Today, BIOS recognizes booting from USB, you may be able to boot from one of those handy flash memory devices known by various names but often called a "thumb drive". There are some possible technical complications that may not allow every system to boot this way but for many systems it is possible to have boot from a thumb drive.

Using MS DOS -Command Prompt

Many of the really useful utilities in Windows are command line-based. Windows Vista and earlier OS give you two options for running command line utilities: `command.com` and `cmd.exe`.

When working with MS-DOS and Windows 9x, the file `command.com` is the command line analyst, and it serves as the basic method of executing programs in the OS. Windows NT-based OS, such as Windows XP and Windows Vista, use `cmd.exe` as the basic command line analyst for issuing commands. When using `cmd.exe`, you are using a Windows 32-bit application from the point of view of memory management and application stability. `Command.com` still exists on these OS, but it exists for backward compatibility for older applications. Here is an example of what Windows Vista shows:

Microsoft Windows [Version 6.0.6001]

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DIR

The first command that you will see is the directory command (`dir`). This command is used to get a listing of the files that are in a directory on your disk. Using `dir` by itself gives you the listing of your current directory. The current directory is usually listed in the command prompt, like this:

```
C:\WINDOWS>_
```

The `dir` command is very useful and has several options discussed later in this section. First, though, you need a firm grasp of wildcards, relative paths, and absolute paths.

Wildcards

Two wildcards can be used to modify what results you receive: `*` and `?`. These can be used multiple times in different combinations in the same command to filter the results. The `*` wildcard represents one or more characters. Here is an example of using the `*` wildcard to retrieve a list of files that match a certain pattern. The command

```
Dir WIN*.EXE
```

The results include all files that start with `win` and end with `xe`, with a number of characters in between – even zero. These wildcards are also useful when used in conjunction with copy commands.

The `?` wildcard character works a little different than `*` because `?` represents one or zero characters. Here is an example of `?` in action, as it looks for all files that were created on the fifth of any month after Jan 01, 2000, given that all the filenames match their dates. The command

```
Dir ??052???.TXT
```

The `?` in the command doesn't return any files that have more than two characters before the `05` and doesn't return any more than three characters after the `2` in the `dir` statement. This is often helpful when files in a directory are named with six- or eight-character numeric dates with the pattern of `mmddyyyy.txt`, and you are looking for all files named for the fifth of any month.

Relative paths and absolute paths

When you use `dir`, you are given a directory listing for your current directory. To see the listing for a different directory, Table 5-1 provides several options for choosing a different directory. All the command examples in the table use this directory structure:

c:\parent_dir\child_dir\grandchild_dir

| | |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>Dir</code> | : Returns the listing for the current directory <code>c:\parent_dir\child_dir</code> |
| <code>Dir c:</code> | : Returns the listing for the current directory on the C drive <code>c:\parent_dir\child_dir</code> |
| <code>Dir c:\parent_dir</code> | : Returns the listing for <code>c:\parent_dir</code> |
| <code>Dir \</code> | : Returns the listing for the root of the current drive <code>c:\</code> |
| <code>Dir ..</code> | : Returns the listing for the parent directory of the current directory <code>c:\parent_dir</code> |
| <code>Dir ..\..</code> | : Returns the listing of the parent directory of the parent directory of the current directory <code>c:\</code> |
| <code>Dir ..\ (child_dir)</code> | : Returns the listing of a directory named <code>child_dir</code> , which is a child of the parent directory <code>c:\parent_dir\child_dir</code> |
| <code>Dir (grand-child_dir)</code> | : Returns the listing of a child directory named <code>grandchild_dir</code> : <code>c:\parent_dir\child_dir\grandchild_dir</code> . |

Whenever a full path is specified, starting with the drive letter, it is referred to as an absolute path. If you do not specify the full path, you are using a relative path. Care should always be taken when using relative paths with commands.

```
Dir sub_dir
Del *.*
```

DIR Switch

DIR /ax

The `/a` switch is short for “attributes.” This switch provides a listing of files that have matching attributes. This switch must be used in conjunction with an additional letter to provide results. Five letters may be used: (d)irectory, (a)rchive, (h)idden, (s)ystem, and (r)ead-only. Use a minus sign with one of these five letters reverses the listing: For example, `/a-d` shows you things that are not directories.

DIR /ox

The `/o` switch is short for “order by.” This switch is also requires an additional letter to tell it how to order or sort. The options available for sorting are (n)ame, (s)ize, (e)xtension, (a)ccessed date (earliest first), and (d)ate modified (earliest first). Using a minus sign (for example, `/o-d`) reverses the order. If you use the letter `g` after the `o` (for example, `/ogd`), directories will be grouped at the top of the list rather than mixed in.

DIR /X

`Dir /b` command displays a bare listing. A bare listing does not include a separate section in the output that tells you the directory that you are working with, but rather displays a single-line listing.

`Dir /p` switch display the directory page wise, directory screen after each full screen of text and waits for a key to be pressed.

`Dir /s` switch includes listings for each subdirectory under the directory listing.

`Dir /w` switch displays text in a wide listing. It enables more text to be displayed onscreen by using multiple columns.

Dir /x switch is used on Windows 2000 and Windows XP computers to display short and long filenames.

MKDIR

MKDIR, or md, is used to create directories; there is no difference between the two commands other than their spelling. The directory created will be in the current directory unless you provide an alternative path to the command, like this:

```
mkdir "c:\temp\my new directory"  
md "c:\temp\my new directory"
```

CHDIR

CHDIR, or cd, is used to change the current directory for a drive to another directory. The drive need not be your current drive; this command can set a current directory on another drive. For example:

```
D:\somedirectory\>c:  
C:\Documents and Settings\ed\>cd \  
C:\>mkdir d:\old_configs  
C:\>cd d:\old_configs
```

RMDIR

RMDIR, or rd, is used to remove or delete directories from your drive. Two rules are imposed on you: Before you delete a directory

- The directory must be empty.
- It cannot be the current directory.

You can empty a directory by using the Del command to delete the files. To remove a directory, though, just specify its location after the rmdir command:

```
rd c:\remove_me
```

If you are using Windows 2000 or a newer Windows OS, you can use an optional switch – /s – that will automatically delete subdirectories and files.

DEL

DEL is used to remove or delete files from your drive.

Del document.doc

In Windows 2000 or a newer Windows OS, you can use an optional switch – /q – that will automatically delete file.

Copying and Moving Files

COPY

The copy command expects you to give at least the name of the file you would like to copy. If you provide only one filename, the selected file is copied into the current directory. If you provide a source filename and a destination directory by using a command like

```
copy c:\source\myfile.txt c:\destination
copy c:\source\myfile.txt c:\destination\myfile2.txt
copy c:\source\*.txt c:\destination
copy c:\source\*. * c:\destination
```

XCOPY

Many times, you have to copy entire directory structures from one location to another. When using the xcopy command, though, you can perform this task in a minimal amount of time. To copy an existing directory named source to a new directory named destination, you would issue the following command:

```
xcopy c:\source\*. * c:\destination\*. *
```

To copy all the subdirectories and empty directories as well, use

```
xcopy c:\source\*. * c:\destination\*. * /s /e
```

Like the copy command, adding /Y will overwrite files without asking for confirmation. The /Y tells the command to answer “yes” to all overwrite prompts.

MOVE

The move command moves files from one directory to another.

```
move c:\source\source_file.txt c:\destination\
```

This example moves the file source_file.txt into the directory c:\destination\. If the destination directory does not exist, you will see an error message.

REN

The ren command is used to rename files and directories. Similar to many of the commands that you have looked at, you specify the source name and a new name for the file or directory.

```
ren old_file_name.txt new_file_name.txt
ren old_file_name.txt new_file_name.doc
ren old_dir new_dir
```

FC - File Comparisons

Of the many special function commands, this section looks a command that can be used to compare files. FC is still a valid and useful tool – is used to compare the contents two files and indicate the differences between the two files. This command is very useful when attempting to compare two very long configuration file for differences.

```
fc c:\file1.txt c:\file2.txt
```

DEFRAG

The purpose of the defrag utility is to fix speed and performance problems with hard drives. As files are written to and then deleted from a disk, they leave holes or blank areas scattered around your drive. When you write files to a disk, they always write to the largest open spaces that are available to them. There will be times when the largest area is not large enough for the entire file, and the file will have to be split into pieces. These fragmented files are slower to access because the disk head has to keep moving to a new location on the drive. To defragment the files on your hard drive, use Computer Management in Windows, or defrag in Windows XP or Windows Vista. To provide command line access to all Windows-based utilities, Microsoft provides command line access to the graphical defragmenter utility.

defrag c:

CHKDSK

CHKDSK serves an important purpose within the Windows operating system. Its job is to check

- The directory structure and directory entries for corruption
- The disk for worn-out areas

Its purpose is to reduce the chance of data loss by catching corruption early and by fixing small problems before they become larger.

chkdsk c:

MEM

The mem command displays usage information about your computer's memory. This information is often useful when trying to optimize the boot process or when trying to maximize the amount of memory available to MS-DOS-based applications. mem runs from within MS-DOS. Running the command by itself displays basic information about how much memory is available to the MS-DOS environment. Two main switches are available to the mem command:

- /c (classify) tells how much space applications are using in upper memory & conventional memory.
- /d (debug) gives you a detailed breakdown of what is stored in the first 1MB of RAM.

ATTRIB

All files have four basic attributes:

1. a: Archive. Files that have been modified.
2. h: Hidden. Are not usually visible.
3. r: Read-only. Cannot normally be deleted, nor can they be m
4. s: System. Have special file protection so that you may not modify them.

The attrib command allows you to change these attributes. The attributes are added or removed from files by specifying the attribute with a + or - character in front of the filename, as in the following statement:

```
attrib -s -h -r config.sys  
attrib -s -h +a +r c:\*.sys
```

FORMAT

Using the `format.com` command prepares a disk to be used by your computer. The purposes of this command are to

- Check whether all clusters on the partition are in working order
- Create the directory table

On FAT partitions, the directory table is referred to as the File Allocation Table. The directory table maintains a list of where each file starts on the disk. The `format` command requires a drive letter and supports additional switches. The proper syntax to format your A: drive is

format a:

You could modify the command by adding `/q` to the end of the line to perform a quick format of the drive. If you are using Windows 2000 or newer Windows OS, you can use `/FS:filesystem` to specify the format of the partition as FAT32 or NTFS.

format a: /q /fs:fat32

VER

The `ver` command indicates what version of the command prompt you are running.

EDIT Command

Most configuration files on your computer can be edited with any text editor. If you have the Windows interface loaded, you will probably prefer to use a graphical program like Notepad or WordPad. If you don't have a computer that is currently running Windows, you can always use the `edit` command.

edit
edit file.txt

Help

If you need to know how to do something with the command line, you have two main options. All commands support `/?` as a switch to get additional information on how to use the command. Additionally, Windows XP and newer versions of Windows also have a `help` command.

Ch. 5 - Hard Disk Partitioning and Formatting

After you physically connect the drive and configure the jumper settings, you need to be aware of the steps to configure the partitions on the disk. The following is the order in which you configure the partitions on the disk:

1. Create a primary partition.
2. Create an extended partition.
3. Create a logical drive in the extended partition.
4. Format the drives to create a file system.

A partition is a section of the hard disk, created by dividing the disk logically into separate units. You create partitions for a number of reasons: say, to organize your applications and operating system on drive C while storing your data on drive D. You might also partition a disk for more technical reasons, such as to run multiple OS on the same machine. Whatever the reason for creating a partition, how you create and manage partitions is important for the Technical Expert.

Frequently, a partition is a means of providing better access to the information stored on a disk. For example, telling the kids that their games are on the D: drive is usually easier than describing a complex path to the folder that holds the games.

Primary Partition

The primary partition is the partition that the computer boots from; the OS's boot files are loaded from here. You are allowed to have four primary partitions per disk. Because you may have multiple primary partitions (say, if you are running several OS on the same computer), you must assign one primary partition as the active partition – the partition from which your normal operating system loads.

Extended Partition

An extended partition allows you to extend partition barrier by being a partition that contains one or more logical drives, which are blocks of disk space assigned a drive letter. Extended partition is, in effect, the space that remains after the primary partitions are defined. The extended partition does not have an actual drive letter assigned to it; it's simply a container that holds all the logical drives that you build. A logical drive is a logical division of the hard disk that the computer treats as if it were a separate disk drive; it is the actual area of the extended partition to which documents are saved.

As an example, suppose you are partitioning a 6GB hard drives using the FAT file system. FAT cannot define partitions larger than 2GB, so you have to divide this drive into at least three different partitions: The first partition you define is the primary partition – a 2GB partition that also becomes the active partition (drive C). What's left is a 4GB extended partition that can store two logical drives (D and E), each of which can be no larger than 2GB.

A hard disk can contain no more than four partitions, only one of which can be the extended partition. This means you could have three primary partitions and one extended partition to hold any logical drives. Having three primary partitions also shows why you have to set the active partition. A primary partition is a bootable partition. But if you have three primary partitions, which one do you boot from? The answer is simple – the one defined as the active partition.

Note that when you create the partition during the installation of Windows, the partition is automatically marked as being the active partition.

1. Using FDISK

To start FDISK you will need to use MS-DOS / Windows 98 bootable disc, start your computer and when you get to the Command Prompt, type 'FDISK' then press <ENTER>.

You will be prompted to decide if you want to enable support for large drives. What this means is - Do you want to use FAT32 on your drive? Since most of today's drives are well in excess of 2GB (The maximum size of a FAT16 drive), you should always answer 'Yes' to this option, provided the drive you are going to partition is over 2GB.

```
Microsoft Windows 98
Fixed Disk Setup Program
(C)Copyright Microsoft Corp. 1983 - 1998

FDISK Options

Current fixed disk drive: 1

Choose one of the following:

1. Create DOS partition or Logical DOS Drive
2. Set active partition
3. Delete partition or Logical DOS Drive
4. Display partition information

Enter choice: [1]

Press Esc to exit FDISK
```

Select one of the following options

1. Create DOS Partition or Logical DOS Drive
2. Set Active Partition
3. Delete DOS Partition or Logical DOS Drive
4. Display partition information

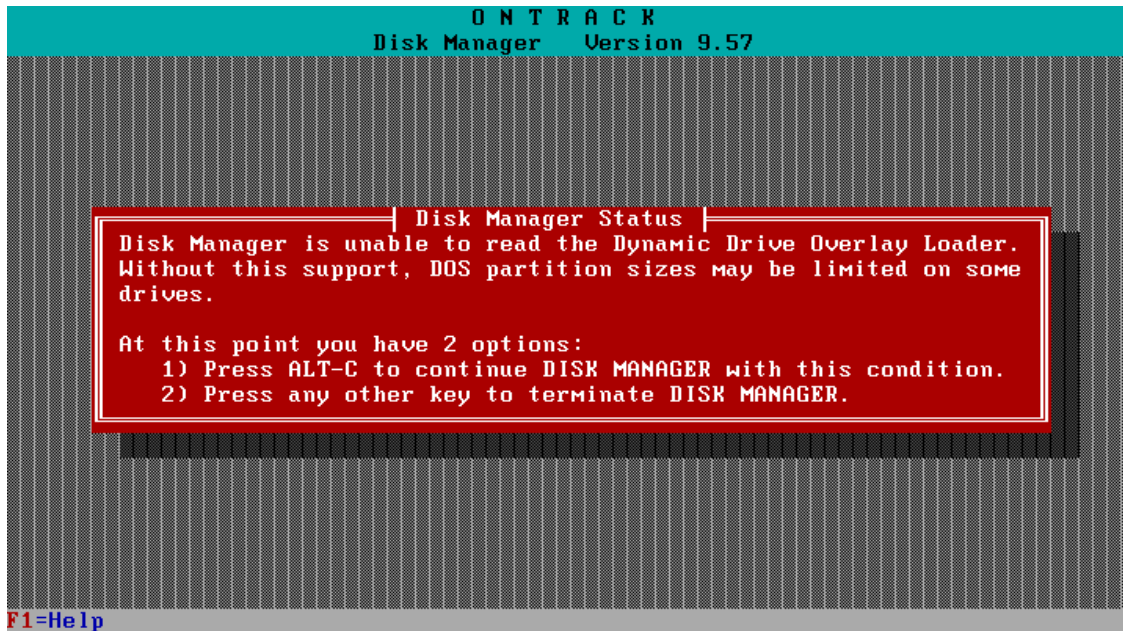
Create DOS Partition or Logical DOS Drive

1. Create Primary DOS Partition
2. Create Extended DOS Partition
3. Create Logical DOS Drive(s) in the Extended DOS Partition

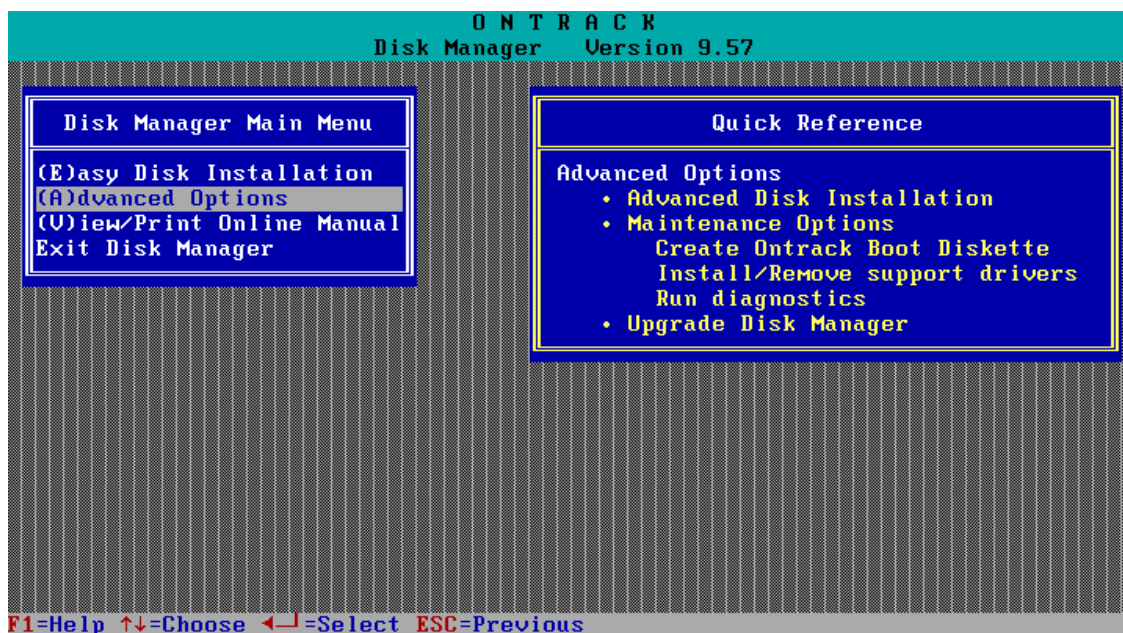
Select the option that you require and press <ENTER>

2. Using DM (Ontrack Disk Manager)

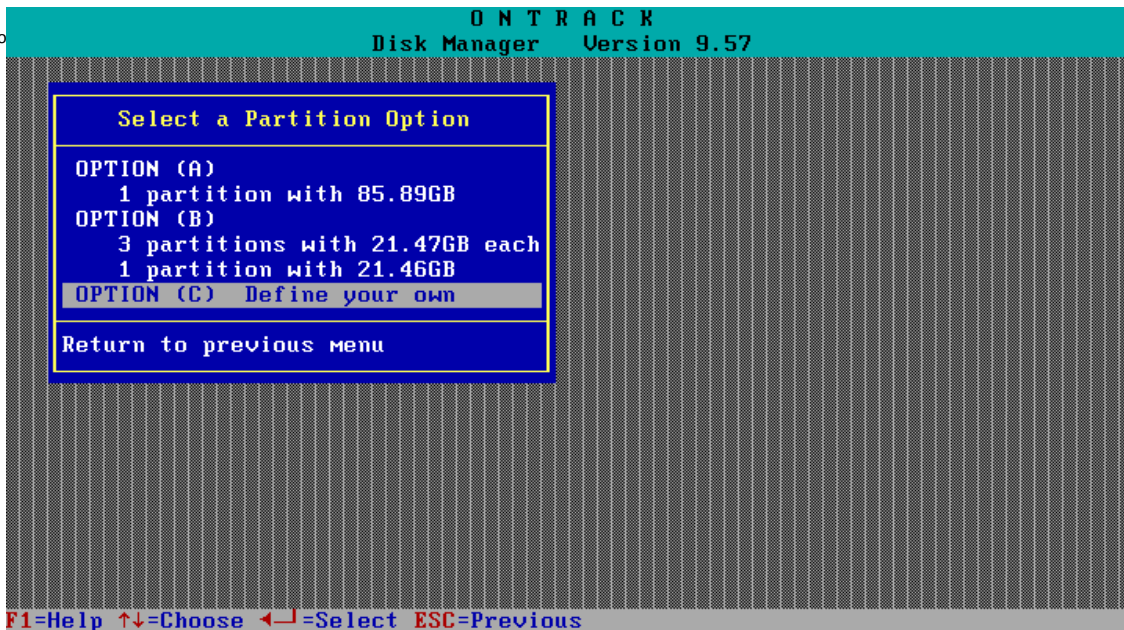
To start Disk Manager you need to insert Software Solution 2010 or later disc in CD-Drive, select Solution Boot then Partition Tools and Ontrack Disk Manager 9.0.



This is main screen of Disk Manager, to continue using Disk Manager you need to press ALT+C. Next screen will appear and you need to press Enter.



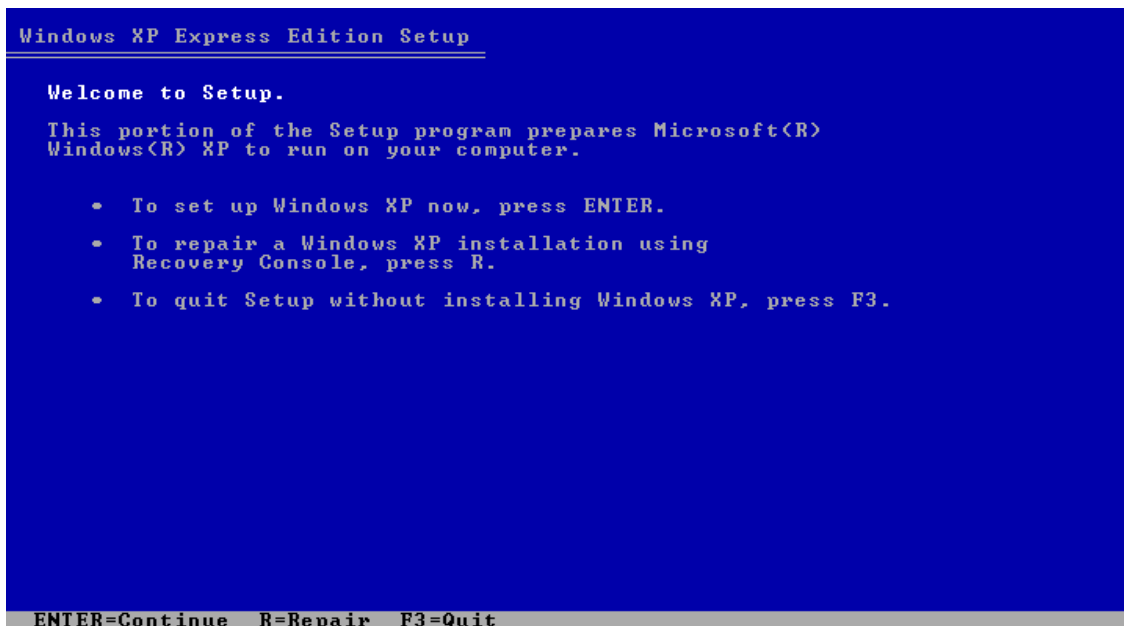
Select Advanced Options on next screen again select Advanced Disk Installation.



Select Option (C) Define your own and press enter. Create partitions of your choice, enter your required size in MB (Mega Byte) and press enter.

3. Using Windows XP Installation Disc

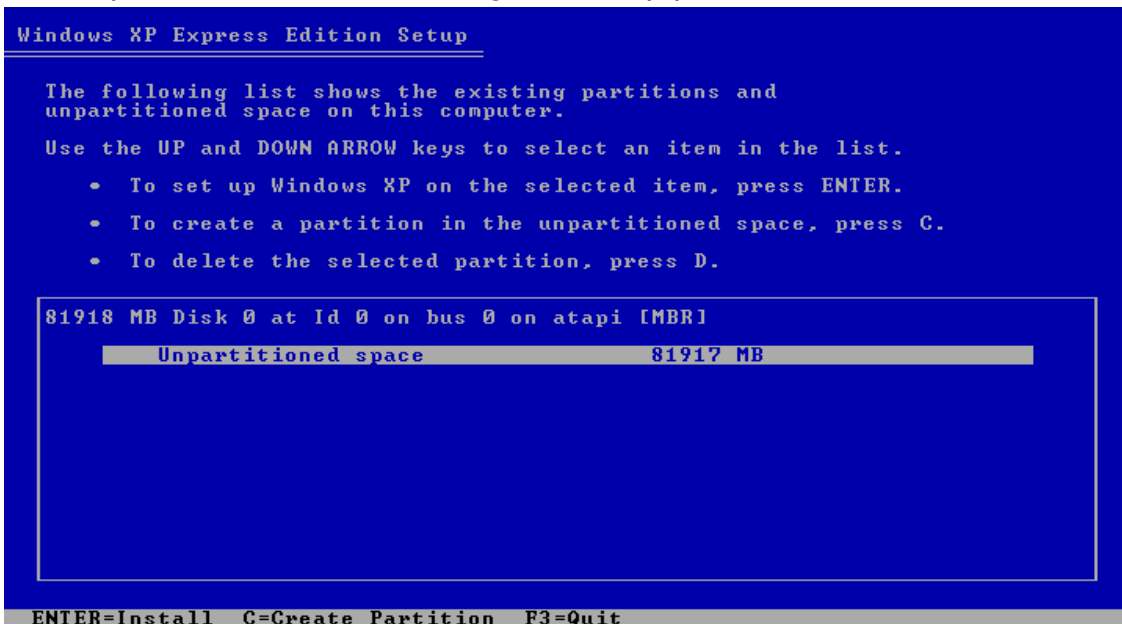
Inset Windows XP installation Disk in CD-Drive, when Windows setup welcome screen appear, press Enter to select first option.



In EULA (End User License Agreement) you need to press F8 to accept agreement. If you have raw hard disk, unpartitioned space otherwise disk partition will be shown.

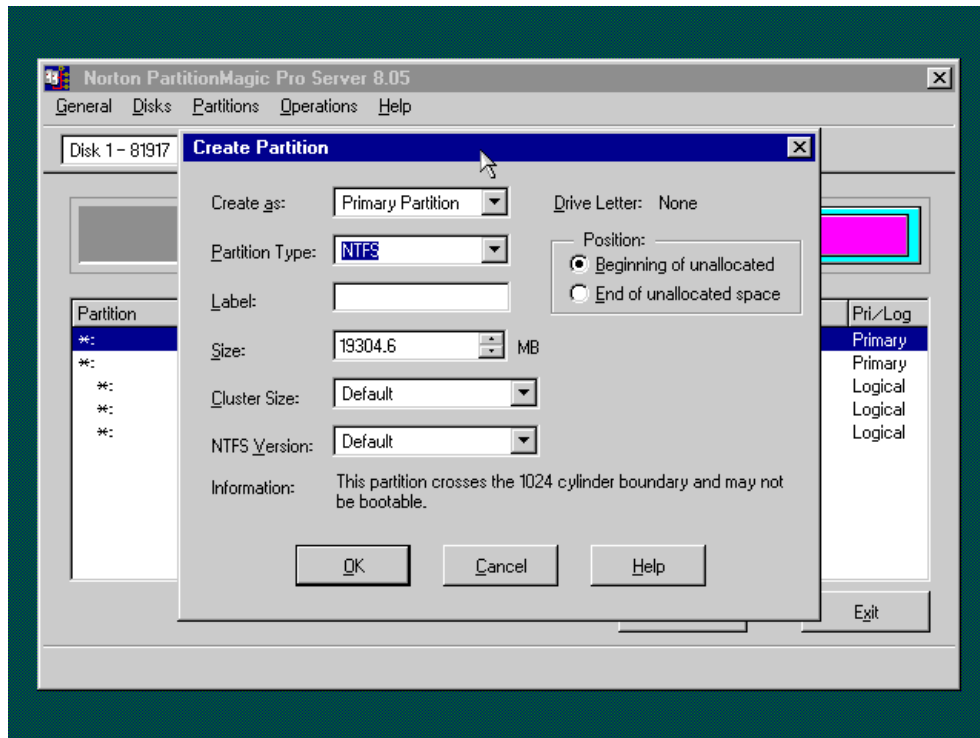
- To create partition, select unpartitioned space with **Aero Keys**, and press **C**. Enter size of partition in MB and press Enter.
- To delete partition, select partition with **Aero Key**, and press **D**, when you press **D** Windows XP Disk Manager will ask confirmation, to confirm press **L**.
- To install Windows XP, Select drive and press Enter.

- To quit Windows XP Disk Manager or Setup press F3.



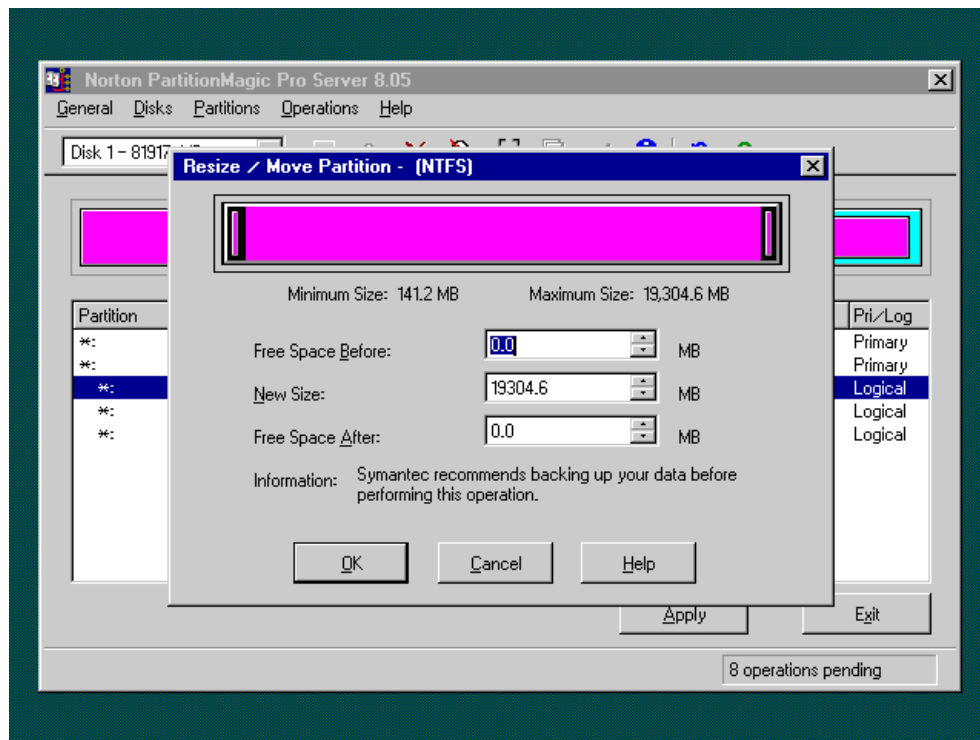
4. Using Norton Partition Magic

To start using Norton Partition Magic 8.5, boot your computer with Oracas Software Solution 360 Disc. In main menu, select option **Hard Disk Tools**, select option **Partition Tools**, select Norton Partition Magic 8.5 and press Enter.

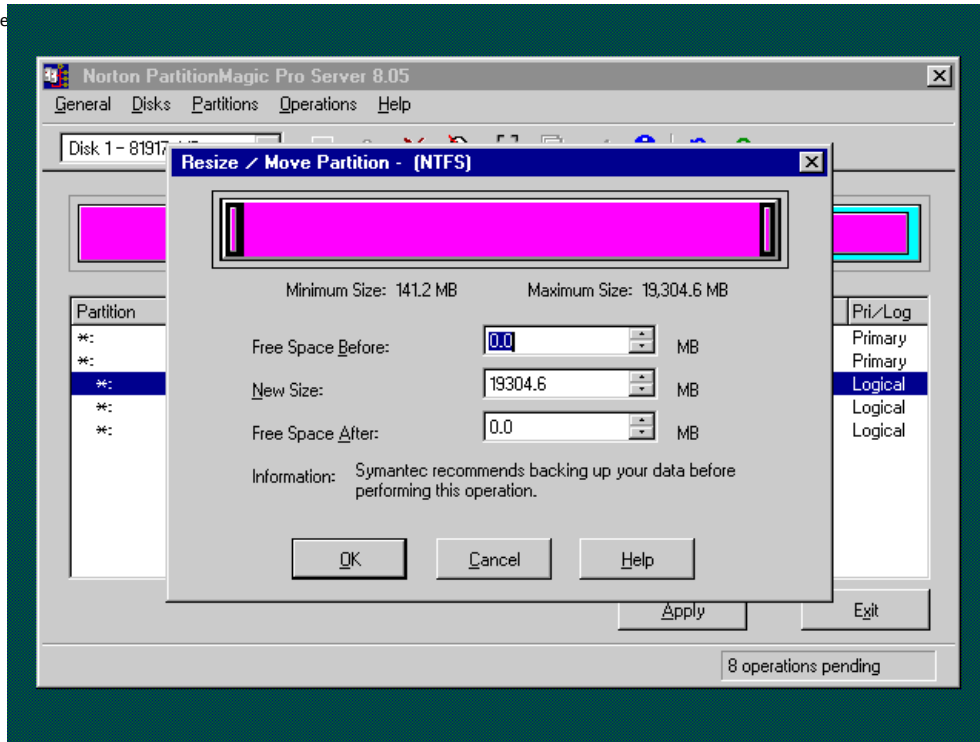


- To create partition, go to **Operation** and select **Create**, in create Dialog Box, **Create** as option Select **Primary** or **Logical Partition**, in **Partition Type** select **FAT32** or **NTFS**, in **Size** enter the size of Partition in MB and Click **OK**.

- To delete partition, go to **Operation** and select **Delete**, in delete Dialog Box, type **OK** to confirm deletion.
- To format partition, go to **Operation** and select **Format**, in format Dialog Box, in **Partition Type** select **FAT32/NTFS**, enter **Label** if you need, Type **OK** to confirm formation.
- To activate Primary Partition, Select Primary Partition, go to **Operation**, select **Advanced** and then **Set Active**.
- To **Resize/Move** Partition, go to **Operation**; select **Resize/Move**, in **Resize/Move** Dialog Box.
 - i. If you want to use **Free Space Before**, select **Free Space Before** option and enter value that you want.
 - ii. If you want to use **Free Space After**, select **Free Space After** option and enter value that you want.



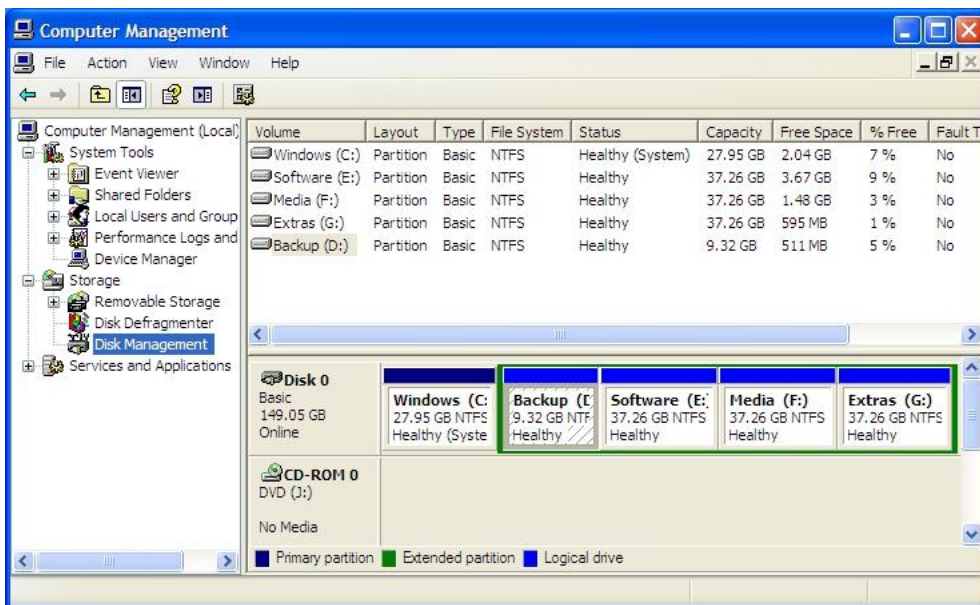
- To **Merge Partitions**, select partition to merge, go to **Operation**; select **Merge**, in **Merge** Dialog Box, all partitions that can be merge will shown. Select Partition that you want to merge with selected partition and type **Folder Name**. All files and folder on merged drive will be added in this Folder that is located on the root of partition.
- When all work done, go to **General** and select **Apply Changes**.



5. Using Windows XP Disk Management Tool

With the Disk Manager program, which is automatically included with the Windows XP operating system, computer users can partition any hard drive connected to their system. Partitioning a hard drive will separate the disk into multiple sectors, so that you can install more than one operating system on a single drive. Before partitioning a hard drive, you should back up all important data on disk.

Open the Control Panel, Administrative Tools, Computer Management, and expand the "Storage" list on the left side of the window and click on the "Disk Manager" tab.



Right-click on the hard drive you want to partition and choose "New Partition." Click "Next" to begin the partitioning wizard. Choose "Primary partition" as the partition type and then select the amount of memory you want to dedicate to the new partition. Select the "Do not format this partition" option and then click "Finish" to complete the partitioning process.

The Disk Management tool is the same for Windows Vista, but to launch it, click the Start button, right-click Computer, and then choose Manage. From the Computer Management console, choose Disk Management in the Storage category.

6. Using Diskpart

To manage disk partitioning, if the need ever begin, Windows 2000 and newer Windows OS use the Disk Management graphical disk partitioning tool. Windows XP and newer Windows OS also use another command line tool, called diskpart. Although this tool is capable of all disk partitioning tasks, you need to use this tool only to perform rare disk partition changes that Disk Management cannot perform, such as expanding a partition on a basic disk.

```

C:\Windows\system32\diskpart.exe
Microsoft DiskPart version 6.0.6001
Copyright (C) 1999-2007 Microsoft Corporation.
On computer: UISTA-64

DISKPART> list disk

   Disk ###  Status         Size           Free           Dyn  Gpt
   -----  -
   Disk 0    Online         233 GB         0 B
   Disk 1    Online         7751 MB        0 B
   Disk 2    Online         1928 MB        0 B

DISKPART> select disk 0
Disk 0 is now the selected disk.

DISKPART> list partition

   Partition ###  Type           Size           Offset
   -----  -
   Partition 1    Primary        220 GB         32 KB
   Partition 2    Primary        13 GB          220 GB

DISKPART> select partition 1
Partition 1 is now the selected partition.

DISKPART> detail partition

Partition 1
Type : 07
Hidden: No
Active: Yes

   Volume ###  Ltr  Label           Fs      Type          Size      Status       Info
   -----  -
   * Volume 1   C:   NTFS            Partition  220 GB    Healthy      System

DISKPART>

```

C:\>diskpart.exe

DISKPART>list disk

DISKPART> select disk 1

Disk 2 is now the selected disk.

DISKPART> create partition primary size=1000

DiskPart succeeded in creating the specified partition.

DISKPART> list partition

DISKPART> select partition 1

Partition 1 is now the selected partition.

DISKPART> assign letter=f

DiskPart successfully assigned the drive letter or mount point.

DISKPART> exit

Leaving DiskPart...

Understanding File Systems & Disk Formatting Process

The file system speaks how information is organized on the disk. For example, the file system determines how large the allocation unit, or storage unit, of a file is. If you create a 12K file, how much space is that file really using – 12K, 16K, or 32K? Such organizational issues are what the file system deals with.

The FAT file system

The File Allocation Table (FAT) file system has been the most popular file system up until the last few years. Although the FAT file system is the most common (it can be used by all OS), it is losing the popularity contest to its successor – FAT32 – because of its age and limitations.

The FAT file system was the file system used by DOS, Windows 3.1, and Windows 9x; and is supported in all current versions of Windows including Windows Vista. FAT's biggest strength is that it is the file system most widely understood by different OS – but it has many shortcomings. One of the major shortcomings is that it cannot create a partition larger than 2GB.

The FAT32 file system

After the retail release of Windows 95, an update to the OS was created, known as Windows 95 OSR2 (OEM Service Release 2). Windows 95 OSR2 introduced an updated FAT file system called FAT32. One of the apparent benefits of FAT32 was that the maximum partition size was increased from 2GB to 2TB. Now, when you go out and buy that 20GB drive, you don't have to divide it into ten partitions; you can keep one 20GB partition.

Although FAT32 has the capability to have partitions of 2TB in size, Microsoft has limited the size of FAT32 partitions in Windows 2000/XP OS to 32GB when creating partitions. The reasoning for this is that you should be using NTFS as a file system. Windows has no problem recognizing a larger FAT32 partition that was created with some other utility, such as the case when you purchase a new external hard drive that is hundreds of GB.

One of the shortfalls of FAT32 is that even with today's OS, no security features are built into FAT32. If you wish to leverage security features in the OS – such as file permissions, auditing file access, and Encrypting File System (EFS) – you need to use NTFS.

NTFS

Starting with Windows NT, Microsoft implemented a new file system: New Technology File System (NTFS). NTFS makes better use of the space available on a particular disk by using 512 bytes as the cluster size (the same size as a sector). This means that you waste even less space on an NTFS file system than on a FAT32 file system.

The original version of NTFS supported a number of features that made it more attractive than the FAT versions of the file systems. With NTFS, you could configure permissions that controlled who could access what files. You could also take advantage of features such as compression and auditing.

This newer version of NTFS has a few extra features over original implementations of NTFS, one of which has been long overdue – disk quotas. Disk quotas allow the system's administrator to choose the amount of disk space that each user is allowed to use by placing a limit on the disk.

Another feature of NTFS 5.0 is the Encrypting File System (EFS). EFS uses public key/private key technology to encrypt a file stored on the hard drive. When a file or folder is encrypted with EFS, only the person who created the file or the recovery agent (by default, the administrator is the recovery agent) can open the file. When using EFS, even if another user has permission to view the file, he or she will be unable to do so because the file is encrypted. The encrypting file system is a big selling point for organizations with mobile users who need to protect the privacy of the data that sits on their laptops.

To summarize, the NTFS file system offers the following features over FAT and FAT32:

- Securing the resource through permissions
- Securing files through encryption
- Enabling auditing to monitor who accesses the files and folders
- Compressing file or folder contents

NTFS is the preferred file system for all current versions of Windows, including Windows Vista, because NTFS has benefits such as permissions, auditing, encryption, and compression.

HPFS

Years ago, the High Performance File System (HPFS), which gained its popularity with the OS/2 operating system, was a major improvement over the FAT file system. Some of the benefits of OS/2 are that it supports long filenames, up to 254 characters (including the path). HPFS also supports partition sizes up to 2000GB and uses a cluster size of 512 bytes! When looking at the benefits of HPFS, you might wonder, “What’s the big deal? I get that with FAT32.” The big deal is that HPFS was released well before FAT32, or even before Windows 9x was designed.

The disadvantage of HPFS is that it is not widely supported. OS such as DOS and Windows cannot access HPFS volumes.

Formatting Partitions

After you create the partitions or volumes, your next step is to format these partitions or volumes so that you may start storing data on them. When you format the partitions or volumes, which now show as drive letters in the My Computer icon, you choose which file system to format them with. Before you format the partitions, you should review the different types of file systems.

DOS Commands in Windows XP or Later version:

format f: /fs:ntfs

format f: /fs:fat32

Ch. 6 - Installing OS & Managing Device Drivers

Operating System

All OSes are responsible for managing hardware, resources, and data. The responsibility of the OS regarding user interface (UI) consists of displaying an interface that always reacts the same way and makes it easy for users to perform tasks. A GUI (graphical user interface) attempts to make tasks easy and intuitive for the user. To provide a space for applications to run and for the user to manage his work, most OS with a GUI use a “desktop” symbol. That is, the desktop is a work area on which you have a computer, a place to store items, and a waste bin. All these elements also exist in the GUI.

The look and feel of the GUI, such as the look of the windows that are used, also applies to the applications that run on the OS. When applications use the same look and feel as the OS, and by having the OS provide common routines and dialog boxes for opening and saving files, there is a consistent appearance for the user, which usually reduces the time required to learn new applications.

32-bit (x86) & 64-bit (x64)

Processors have changed from 16-bit to 32-bit, and now the move is on to 64-bit processors. With each change, the internal processing power of the processor greatly increases. To maximize this processing power, you require an OS that can work with data the same way that the processor can work with the data.

In addition to most current Linux distributions and Mac OSX, Windows XP, Windows Server 2003, 2008, and Vista all support 32-bit and 64-bit processors, depending on the version of the OS installed. For example, if you install the 64-bit version of the OS, you need 64-bit device drivers and applications to achieve performance benefit.

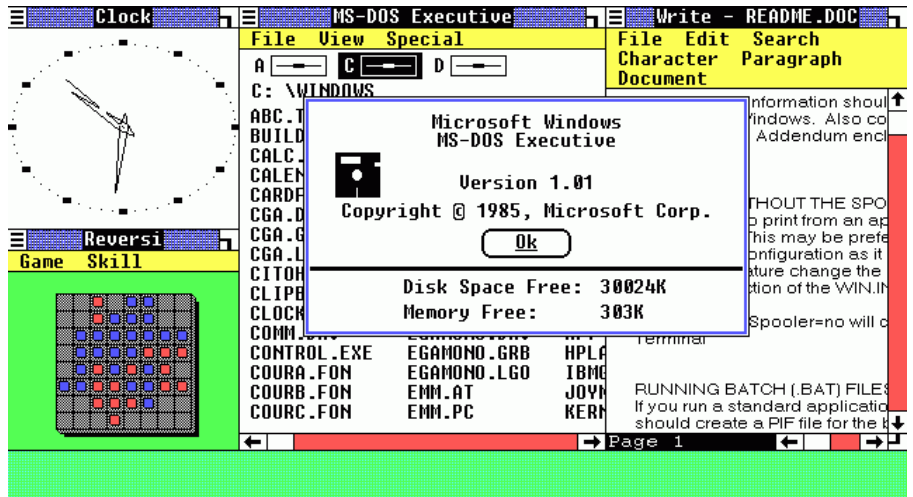
Microsoft Windows

The look and feel of Windows today is very different from the look and feel of Windows 3.0. Windows XP and Windows Vista streamlined the UI and added features, such as Wireless Zero Configuration, to make it easier to use your computer.

Microsoft Windows is a series of software operating systems and graphical user interfaces produced by Microsoft. Microsoft first introduced an operating environment named Windows in November 1985 as an add-on to MS-DOS in response to the growing interest in graphical user interfaces. Microsoft Windows came to control the world's personal computer market, overtaking Mac OS, which had been introduced previously. As of October 2009, Windows had approximately 91% of the market share of the client operating systems for usage on the Internet. The most recent client version of Windows is Windows 7; the most recent server version is Windows Server 2008 R2; the most recent mobile OS version is Windows Mobile 6.5.

Microsoft Windows 1.0

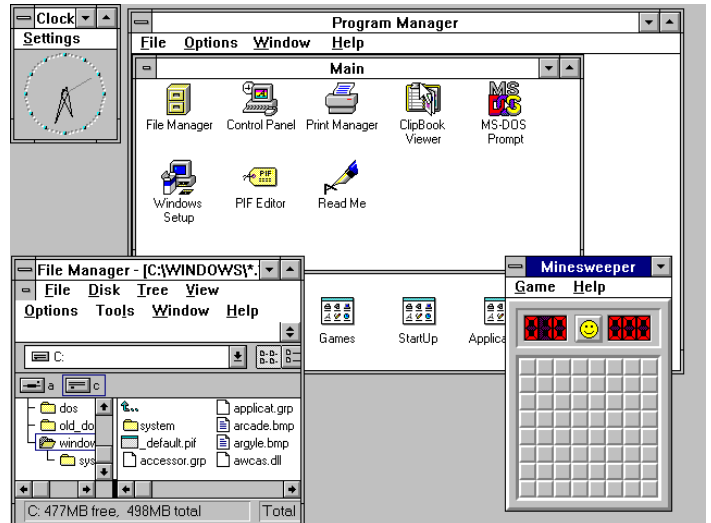
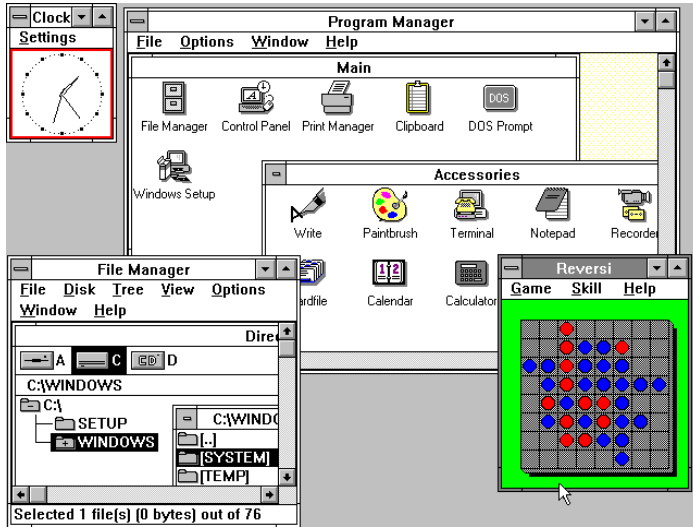
The history of Windows dates back to September 1981, when the project named "Interface Manager" was started. It was announced in November 1983 (after the Apple Lisa, but before the Macintosh) under the name "Windows", but Windows 1.0 was not released until November 1985.



Microsoft Windows 3.0 and 3.1

Windows 3.0 (1990) and Windows 3.1 (1992)

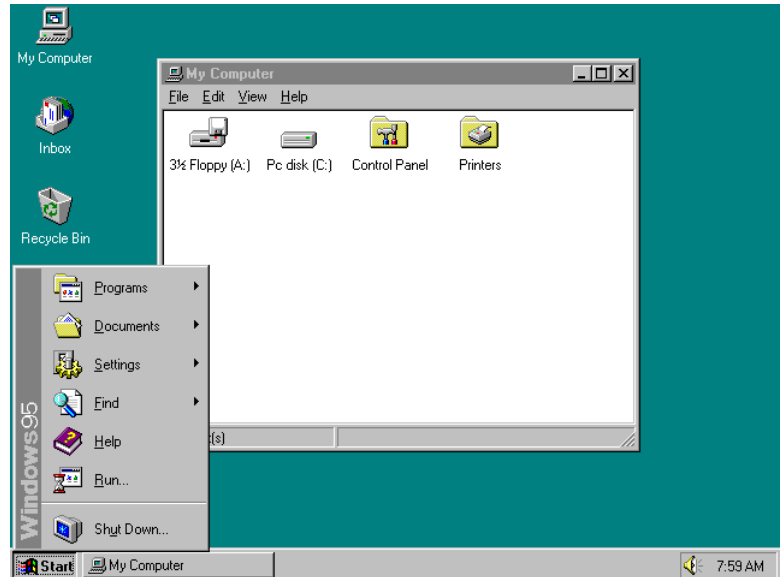
improved the design, mostly because of virtual memory and loadable virtual device drivers which allowed them to share arbitrary devices between multitasked DOS windows. Also, For Windows 3.0, Microsoft also rewrote critical operations from C into assembly, making this release faster and less memory-hungry than its predecessors.



Microsoft Windows 95

After Windows 3.11, Microsoft began to develop a new consumer oriented version of the operating system code-named Chicago. Chicago was designed to have support for 32-bit preemptive multitasking like OS/2 and Windows NT, although a 16-bit kernel would remain for the sake of backward compatibility.

Windows 95 was released in August 1995, featuring a new user interface, support for long file names of up to 255 characters, and the ability to automatically detect and configure installed hardware (plug and play). It could natively run 32-bit applications, and featured several technological improvements that increased its stability over Windows 3.1.



Microsoft Windows 98

On 25 June 1998, Microsoft released Windows 98 (code-named Memphis). It included new hardware drivers and better support for the FAT32 file system which allows support for disk partitions larger than the 2 GB maximum accepted by Windows 95. The USB support in Windows 98 is far superior to the token, unreliable support provided by the OEM editions of Windows 95. It also controversially integrated the Internet Explorer browser into the Windows GUI and Windows Explorer file manager.

In 1999, Microsoft released Windows 98 Second Edition, an interim release. One of the more notable new features was the addition of Internet Connection Sharing, which was a form of network address translation, allowing several machines on a LAN (Local Area Network) to share a single Internet connection. Second Edition was also much easier to use and much smoother than the first edition of Windows 98. Hardware support through device drivers was increased. Many minor problems present in the original Windows 98 were found and fixed which make it, according to many, the most stable release of Windows 9x family—to the extent that commentators used to say that Windows 98's beta version was more stable than Windows 95's final (gamma) version.

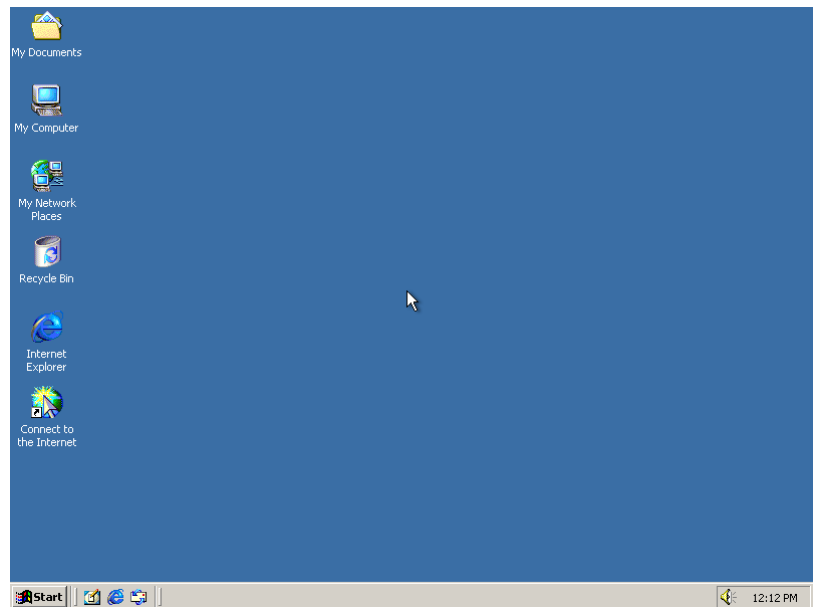


Microsoft Windows 2000

Microsoft released Windows 2000, known during its development cycle as Windows NT 5.0, in February 2000. It was successfully deployed both on the server and the workstation markets. Amongst Windows 2000's most significant new features was Active Directory, a near-complete replacement of the NT 4.0. A number of features from Windows 98 were incorporated as well, such as an improved Device Manager, Windows Media Player, and a revised DirectX that made it possible for the first time for many modern games to work on the NT kernel.

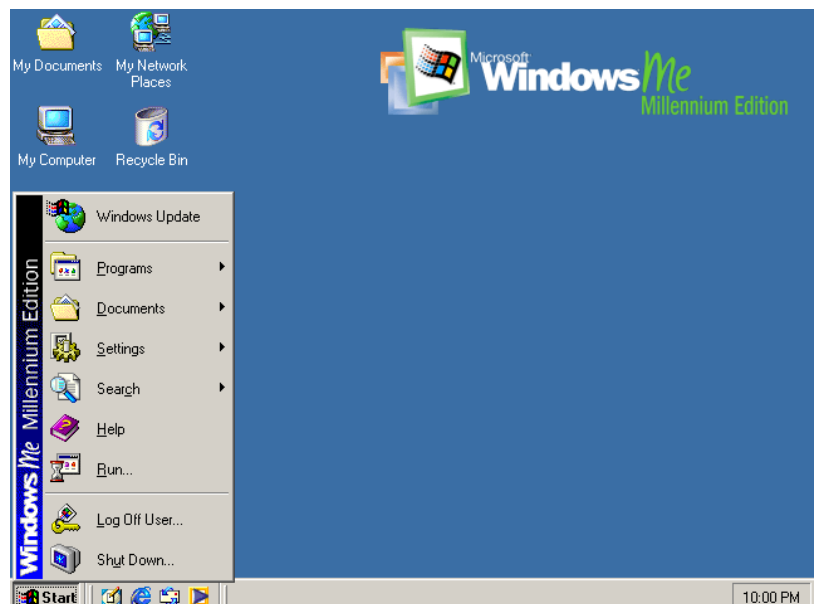
Windows 2000 was available in six editions:

- Windows 2000 Professional
- Windows 2000 Server
- Windows 2000 Advanced Server
- Windows 2000 Datacenter Server
- Windows 2000 Advanced Server Limited Edition
- Windows 2000 Datacenter Server Limited Edition



Windows Millennium Edition (Me)

In September 2000, Microsoft released Windows Me (Me standing for Millennium Edition), which updated the core from Windows 98 but adopted some aspects of Windows 2000 and removed the "boot in DOS mode" option. It also added a new feature called System Restore, allowing the user to set the computer's settings back to an earlier date. It also introduced the first version of System Restore, which allowed users to revert their system state to a previous "known-good" point in the case of system failure. System Restore was a notable feature that made its way into Windows XP. The first version of Windows Movie Maker was introduced as well.



Microsoft Windows XP

In 2001, Microsoft released Windows XP (code named "Whistler"). The merging of the Windows NT/2000 and Windows 95/98/Me lines was finally achieved with Windows XP. Windows XP uses the Windows NT 5.1 kernel, marking the entrance of the Windows NT core to the consumer market, to replace the aging 16/32-bit branch. Windows XP SP1 was released in September 2002, SP2 came out in August 2004 and SP3 came out in April 2008. Service Pack 2 provided significant improvements and encouraged widespread adoption of XP among both home and business users. Windows XP lasted longer as Microsoft's flagship operation system than any other version of Windows, from 2001 to January 30, 2007, when it was succeeded by Windows Vista.



Windows XP is available in a number of versions:

1. Windows XP Home Edition, for home desktops and laptops
 - a. Windows XP Home Edition N, as above, but without a default installation of Windows Media Player, as mandated by a European Union ruling
2. Windows XP Professional, for business and power users
 - a. Windows XP Professional N, as above, but without a default installation of Windows Media Player, as mandated by a European Union ruling
3. Windows XP Media Center Edition (MCE), released in October 2002 for desktops and notebooks with an emphasis on home entertainment
 - a. Windows XP Media Center Edition 2003
 - b. Windows XP Media Center Edition 2004
 - c. Windows XP Media Center Edition 2005, released on October 12, 2004.
4. Windows XP Tablet PC Edition, for tablet PCs
 - a. Windows XP Tablet PC Edition 2005
5. Windows XP Embedded, for embedded systems
6. Windows XP Starter Edition, for new computer users in developing countries
7. Windows XP Professional x64 Edition, released on 25 April 2005 for home and workstation systems utilizing 64-bit processors based on the x86-64 instruction set developed by AMD as AMD64; Intel calls their version Intel 64

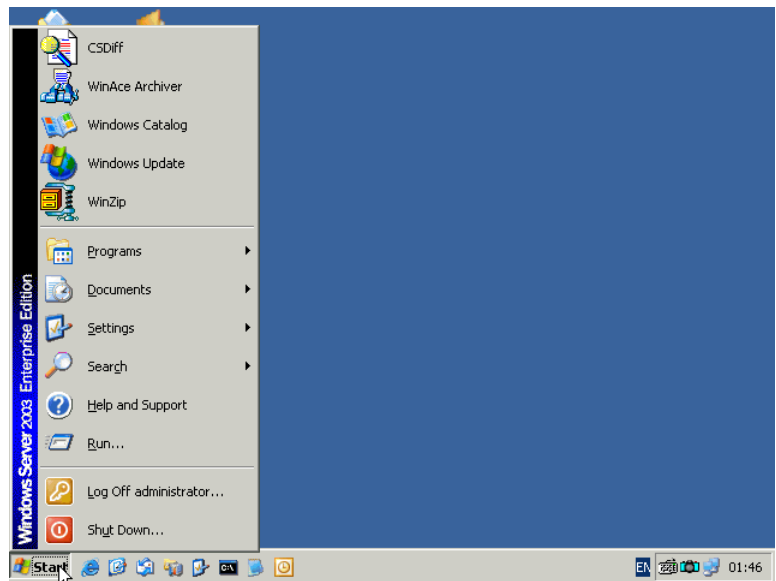
Windows Server 2003

On April 25, 2003 Microsoft launched Windows Server 2003, a notable update to Windows 2000 Server encompassing many new security features, a new "Manage Your Server" wizard that simplifies configuring a machine for specific roles, and improved performance. It has the version number NT 5.2. A few services not essential for server environments are disabled by default for stability reasons, most noticeable are the "Windows Audio" and "Themes" services; Users have to enable them manually to get sound or the "Luna" look as per Windows XP.

December 2005, Microsoft released Windows Server 2003 R2, which is actually Windows Server 2003 with SP1 (Service Pack 1) plus an add-on package. Among the new features are a number of management features for branch offices, file serving, printing and company-wide identity integration.

Windows Server 2003 is available in six editions:

1. Web Edition (32-bit)
2. Standard Edition (32 and 64-bit)
3. Enterprise Edition (32 and 64-bit)
4. Datacenter Edition (32 and 64-bit)
5. Small Business Server (32-bit)
6. Storage Server (OEM channel only)



Microsoft Windows Vista

Windows Vista was released on November 30, 2006 to business customers, consumer versions following on January 30, 2007. Windows Vista intended to have enhanced security by introducing a new restricted user mode called User Account Control, replacing the "administrator-by-default" philosophy of Windows XP. One major difference between Vista and earlier versions of Windows, Windows 95 and later, is that the original start button was replaced with just the Windows icon. Vista also features new graphics features, the Windows Aero GUI, new applications such as Windows Calendar, Windows DVD Maker and some new games including Chess, Internet Explorer 7, Windows Media Player 11, and a large number of underlying architectural changes.



Windows Vista ships in six editions:

1. Starter (only available in developing countries)
2. Home Basic
3. Home Premium
4. Business
5. Enterprise (only available to large businesses and enterprises, not for common people)
6. Ultimate (combines both Home Premium and Enterprise)

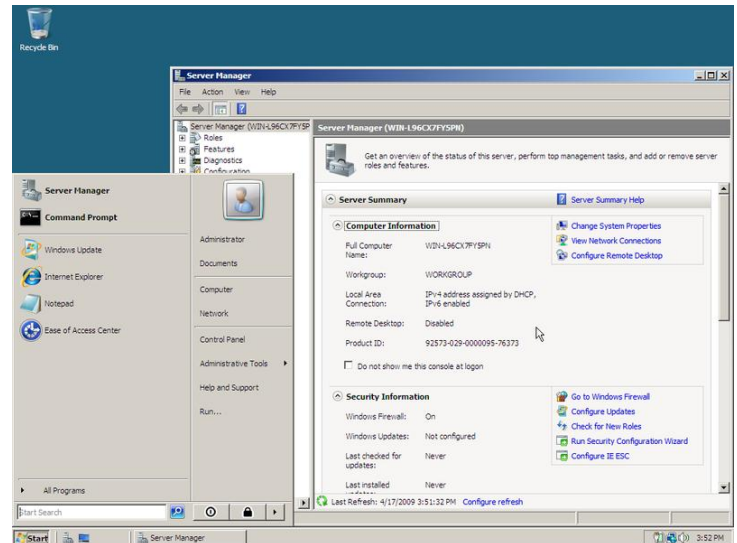
All editions (except Starter edition) are currently available in both 32-bit and 64-bit versions. The biggest advantage of the 64-bit version is breaking the 4 gigabyte memory barrier, which 32-bit computers cannot fully access.

Windows Server 2008

Windows Server 2008, released on February 27, 2008, was originally known as Windows Server Codename "Longhorn". Windows Server 2008 builds on the technological and security advances first introduced with Windows Vista, and is significantly more modular than its predecessor, Windows Server 2003. At the Professional Developers Conference (PDC) 2008, Microsoft announced Windows Server 2008 R2, as the server variant of Windows 7. Windows Server 2008 R2 ships in 64-bit (x64 and Itanium) only.

Windows Server 2008 ships in ten editions:

1. Windows Server 2008 Standard Edition (32-bit and 64-bit)
2. Windows Server 2008 Enterprise Edition (32-bit and 64-bit)
3. Windows Server 2008 Datacenter Edition (32-bit and 64-bit)
4. Windows HPC Server 2008 (High Performance Computing)
5. Windows Web Server 2008 (32-bit and 64-bit)
6. Windows Storage Server 2008 (32-bit and 64-bit)
7. Windows Small Business Server 2008 (64-bit only)
8. Windows Essential Business Server 2008 (32-bit and 64-bit)
9. Windows Server 2008 for Itanium-based Systems
10. Windows Server 2008 Foundation Server

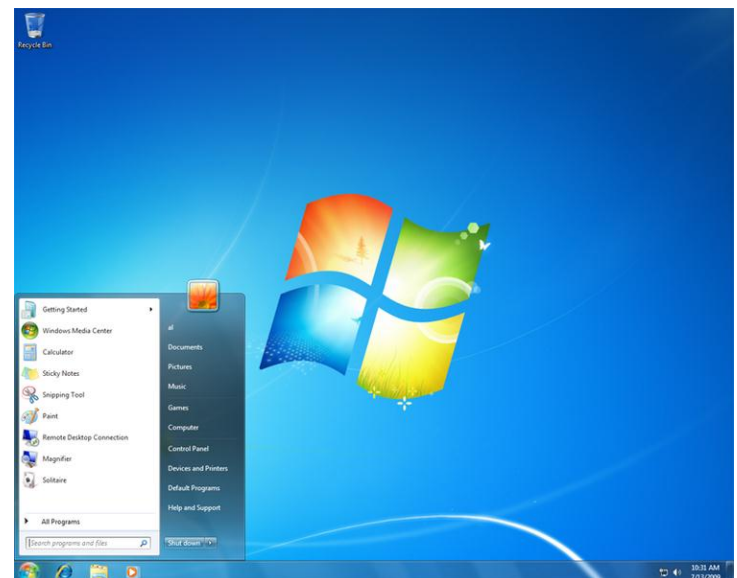


Microsoft Windows 7

Windows 7 is the current major release after Windows Vista and was planned for a three-year development timeframe. It was previously known by the code names Blackcomb and Vienna. Some features of Windows 7 are faster booting, Device Stage, Windows Power Shell, less obtrusive User Account Control, multi-touch, and improved window management. Features included with Windows Vista and not in Windows 7 include the sidebar (although gadgets remain) and several programs that were removed in favor of downloading their Windows Live counterparts.

Windows 7 ships in six editions:

1. Starter (available worldwide with new PCs only)
2. Home Basic (only available in developing countries)
3. Home Premium
4. Professional
5. Enterprise (available to volume-license business customers only, not for common people)
6. Ultimate (available to retail market with limited availability to OEMs)



In some countries there are other editions that lack some features such as Windows Media Player and Internet Explorer called names such as "Windows 7 N." Microsoft focuses on selling Windows 7 Home Premium and Professional. All editions, except the Starter edition, are available in both 32-bit and 64-bit versions.

1. Installing Windows XP

You can use a number of different techniques to install an OS. But before I discuss the actual installation procedures, you should understand the overall approach you will take to install the OS. When you boot from the CD, the installation is activated automatically, and you instantly begin installing the OS.

The other benefit of the recent versions of Windows installations is that Microsoft provides an opportunity to partition and format the disk from within the installation program itself. This is a huge benefit because you don't need to boot from a boot diskette first and use partitioning tools like **fdisk** like you do with Windows 9x. Your goal now is simply to start the installation and take care of all partition and formatting tasks from within the installation.

System Requirements

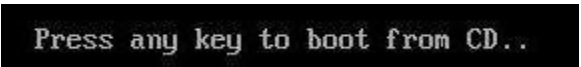
As noted in my overview to this Installation and Upgrade Super Guide, Microsoft's minimum requirements for Windows XP are a Pentium II 233 MHz processor and 64 MB of RAM. I find this to unrealistic, however, and believe you'll get the best performance with a 500 MHz or higher CPU and 256 MB of RAM or more. Remember that memory is not only cheap, but the simplest way to improve XP's performance: If you are wondering about a CPU upgrade, I'd try the RAM first.

Other system requirements include 1.5 GB of available hard drive space, a Super-VGA (800 x 600) or higher resolution monitor and video card, a CD-ROM or DVD-drive, and a keyboard and mouse. Optional components include a networking adapter and/or modem, and a sound card and speakers. You should try and run XP at 1024 x 768 or higher resolution with 24-bit color, if possible.

Windows XP Installation Process

Go to your system's BIOS Setup Program by pressing DEL or F2 Key when your computer is starting up. Select First Boot Device as CD/DVD-Drive and then save configuration by pressing F10 Key.

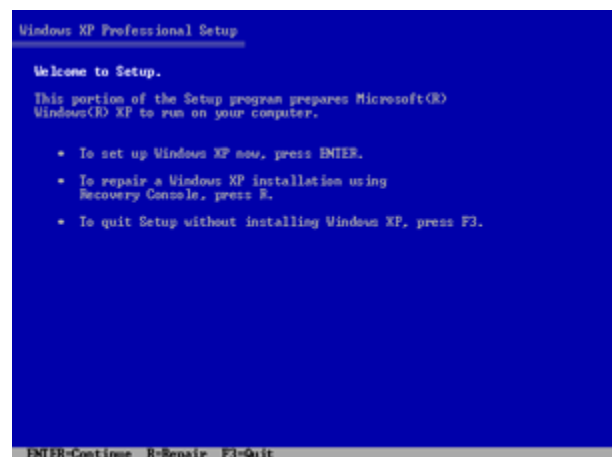
Insert the Windows XP bootable CD into CD/DVD-Drive and reboot the computer. If you see a message about hitting any key to boot the CD (Press any key to boot the CD...), do so now. Otherwise, you will see a message about Setup inspecting your system. In the first stage of Setup, you will see a series of blue and gray MS-DOS-based screens.



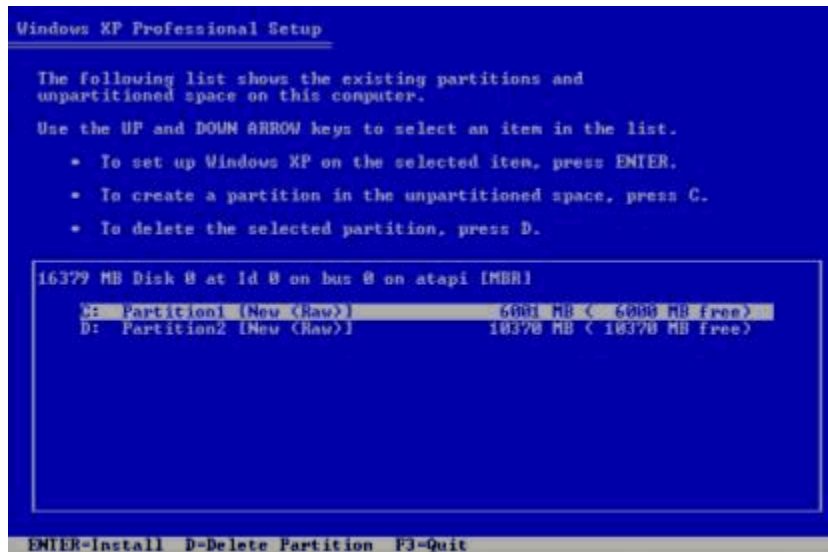
Press any key to boot from CD..

The next step setup will prompt "Press ENTER to continue Setup" and it will examine your hard drives and removable disks.

Next, you'll have to agree to Microsoft's EULA (End User License Agreement). Hit F8 to continue.



If Windows Setup automatically detects your previous windows, it will ask you, what you want. Upgrade previous windows or clean installation, we recommend clean installation of Windows XP. If you wish to upgrade your previous windows press enter, for clean installation press Esc key. If your hard Disk does not contain any previous windows, you will not see this screen.



In the next screen select your "C:" Drive for installation and press enter.

Now setup will format partition, for using Windows XP format option select one of the top two choices. NTFS stands for New Technology File System and FAT stands for File Allocation Table file system. NTFS File system is best and secure, if you want to use this file system select format partition using NTFS File system and press enter. If you r using more then one operating system on your PC for example Windows 98/ME/2000/XP, Please don't use NTFS File system because Windows 98/ME and other previous Versions of windows will not access NTFS file system.



When formatting will complete setup will copy file to the windows installation folder. When this process will complete successfully setup will reboot your computer. When your computer is starting up press Del or F2 Key for enter system setup, select “Hard Disk/IDE-0/HDD-0/Har Disk only” for First Boot Device and press F10 for save setting. Your computer will restart again.

You'll be greeted by the XP splash screen on first boot.

Once the system reboots, you will be presented with the GUI (Graphical User Interface) Setup phase, which is much more attractive than the DOS-mode phase. As you progress through GUI Setup, you can read promotional information about XP on the right side of the screen if you're bored.

In the first interactive portion of GUI Setup, you can choose to customize the regional and language settings that will be used by XP.

Now, enter your name and, optionally, your company.

Now you must enter the 25-character product key that is located on the orange sticker found on the back of the CD holder that came with Windows XP.

In the next phase of Setup, you can create a name for your computer and password for the system Administrator.

You can supply the date and time, which is auto set, based on information in your BIOS, and the time zone needs to update.

If you have a network card setup will display this screen click next to continue.

Now setup will continue to completion without any further need for interaction and computer restart again.



Verifying and Troubleshooting the Installation

Windows creates a number of log files during installation. If installation does not go as you planned, peruse these logs for more information about an error. These log files report information only for events that happen during the installation, so if you're troubleshooting something like booting Windows or networking, these files won't help. The log files created during installation are:

- Setupact.log records information about the files that are copied during installation.
- Setuperr.log records information about errors that happen during installation.
- Setupapi.log records information about device driver files that are copied during installation.
- Setuplog.txt records additional information about the device drivers.

Be sure to remember the log files that are created when you install Windows. These files can be used to help troubleshoot problems with the installation of Windows.

2. Upgrading Windows

You will be responsible for understanding how to upgrade from previous versions of Windows to Windows 2000, XP, and Windows Vista. This section introduces you to the theory of upgrading an OS.

Many businesses run Windows, so understanding how to upgrade is important. Whether installing the OS from scratch or performing an upgrade, the process is pretty much the same. Before you upgrade any OS, backup the system and any important data. You never know when an upgrade is going to go bad, so make sure you can at least put the system back to its previous state.

Before you upgrade to Windows XP, check the existing system for known compatibility issues with Windows XP by using the Upgrade Advisor. The Upgrade Advisor identifies compatibility issues and gives details on resolution for these issues.

To run the Upgrade Advisor, execute `x:\i386\winnt32.exe` with the `/checkupgrad` only switch, or you can launch it from the splash page that appears after inserting the Windows XP CD. Select the Check System Compatibility option and then choose to Check My System Automatically. The Upgrade Advisor runs and displays any compatibility problems.

3. Installing Windows XP Power Ghost

Windows XP Power Ghost is the fastest way of the installing Windows XP; it installs Windows XP with in 2 minutes. It includes "Windows XP Express Edition with Service Pack 3" which is the most wanted edition of Windows XP. Windows XP Express Edition is swift operating system that is not only starts fast but also open programs more efficiently and stability feature has also kept in view. To install Windows XP Power Ghost, you need to obtain disc of product.

4. Installing Windows Vista / 7

The steps to perform installation of Windows Vista are very similar to other versions of Windows, but the architecture of the installation program has changed. Windows Vista no longer uses the text-mode installation phase that was part of all other Windows installations.

Place the Windows Vista installation DVD in system and restart the computer. The computer boots off the DVD and then starts the Vista installation by loading files into memory. After Vista loads the GUI installation shell, you are asked to set your preferred language, and also time and currency format; then click next.



Like previous versions of Windows, you can perform a repair of a system from the Windows installation media. For clean installation, click Install Now.

You then asked whether you want to upgrade your current version of Windows to Vista or perform a clean installation by choosing Custom.

Choose Custom, when next presented with a list of hard drives where you can install Windows Vista, choose the drive you wish and then click next.

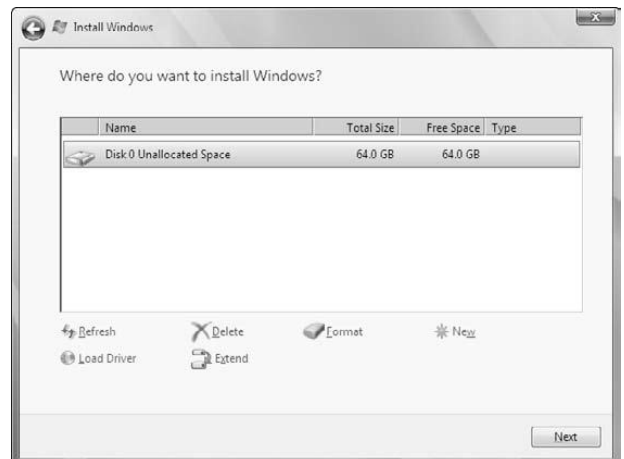
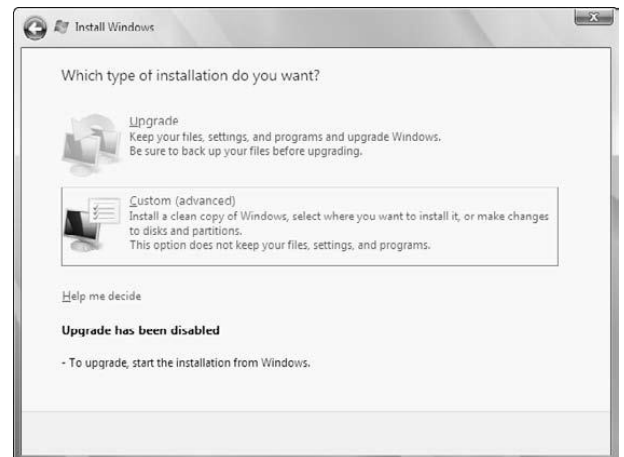
Click the Advanced link to access options for creating, deleting, and formatting partitions.

Windows copies the files it needs, expands them, and then continues installation. This step might take the good part of 30 minutes.

Create a user account (for yourself), which will have administrator capabilities. Type a username and a password; then click next.

When asked the name of the computer, enter a name of less than 15 characters. Also choose your desktop background. Then click next.

a repair of a system from the Windows



Dual Boot Configuration

Dual-booting – running multiple Oses on the same computer – is different than performing an upgrade. With an upgrade, all applications and their settings carry forward into the new OS. When you dual-boot, you install each OS into a different folder, which means that the applications do not carry forward into your new OS. With a dual-boot scenario, you need to install the applications with each OS installed.

One reason why you might want to dual-boot multiple Oses is to test or support applications in the different Oses. You might also want to dual-boot if your company uses an application that won't function on your primary OS (for example, Windows 2000) but works great in an older OS (for example, Windows 98). You can install both Oses on the computer and then install the application that doesn't work in Windows 2000 on the Windows 98 system; any time you want to use that application, you just boot to Windows 98. To dual-boot multiple Oses, the following criteria must be met:

- The bootable drive (usually drive C:) must have a file system supported by all Oses on the computer.
- You must install each OS into its own folder.

Backing up User Data Files

You can move a user's computer's state from one system to another. The state of a user's computer comprises the information and settings important to that user. This includes files in the My Documents folder, e-mail settings, Internet Explorer favorites, and the desktop wallpaper, just to name a few.

Windows XP offers the User State Migration Tool (USMT) feature, which is a set of features that can simplify your life when you need to move computer settings from one system to another. The USMT is made up of the Files and Settings Transfer (FAST) Wizard and the command line tools. Just a note that Windows Vista has a similar feature called the Windows Easy Transfer!

Go to Start, Run and type: migwiz

The FAST Wizard copies all the user state information that you specified on that computer. If you selected the Both Files and Settings option, the FAST Wizard saves these items by default to the location you specified:

- Contents of My Documents
- Contents of My Pictures
- Contents of Desktop
- Contents of Favorites
- Internet Explorer Favorites
- Browser and mail settings
- Accessibility options
- Display properties
- Folder and Taskbar settings
- Mouse and Keyboard settings
- Regional settings
- Microsoft Office applications settings

Windows XP Express Edition

Windows XP Express Edition is the latest and Customized Edition of Windows XP, developed by ORACAS for organization internal use only. It is based on Microsoft Windows XP Service Pack 3, but we have customized Windows XP source and embedded many new tools. Windows XP Express Edition sports a visual design that combines a sleek look. We have added new explorer, new logon screen, new theme and sound alerts. In addition the product supports modern themes.

1. Fast and Reliable Windows

Installation source is too small, Microsoft Windows XP Professional Service Pack 3 takes 680MB on CD but Windows XP Express Edition take 430MB on CD without absence of any professional tool, so windows take short time for installation near about 15-20 minutes but Windows XP take 40-60 minutes. We have reduced size of Windows by removing Windows Tour, MSN Explorer, Windows Messenger and all previous versions of Windows Media Player. After Installation, windows take 800MB of hard drive.

2. Windows Update and Security

During the windows installation process setup will automatically installs Adobe Flash Player 10, Windows Installer 3.1, K-Lite Codec, QuickStart, Veiled Virus Cleaner and many other hotfixes.

Hide Folder can protect your personal files or folders from unauthorized access, now you can protect your folders with password.

Veiled Virus Cleaner will help you to clean viruses and fix windows; it will also clean all viruses during the windows installation process.

3. Automatic Installation

Windows installs automatically without entering any product key, time zone, country selection and other settings, simply boot from CD, select partition and sit back, windows will be installed automatically.

During the windows installation process setup will automatically installs Foxit PDF Reader, QuickStart, ACE Utilities, Hide Folder Encryption, Urdu Support, Windows Media Player Classic, Windows Media Player 11, Registry Performance Enhancements and many other tools.

4. Urdu Support

In Windows XP Express Edition we have added Urdu language support. Now you can use Urdu in Microsoft Word, Microsoft Excel, Microsoft Power Point, Yahoo Messenger, Windows Live Messenger and other programs. In addition we are providing Urdu Keyboard Layout in PDF format that will help you in Urdu typing.

Managing Device Drivers

Device drivers are so important; you should consider how device drivers are loaded onto your system. In the following sections, you take a look at loading device drivers for Windows. Drivers and their installation are tied to INF files, which contain installation instructions. There are several ways to install drivers with INF files:

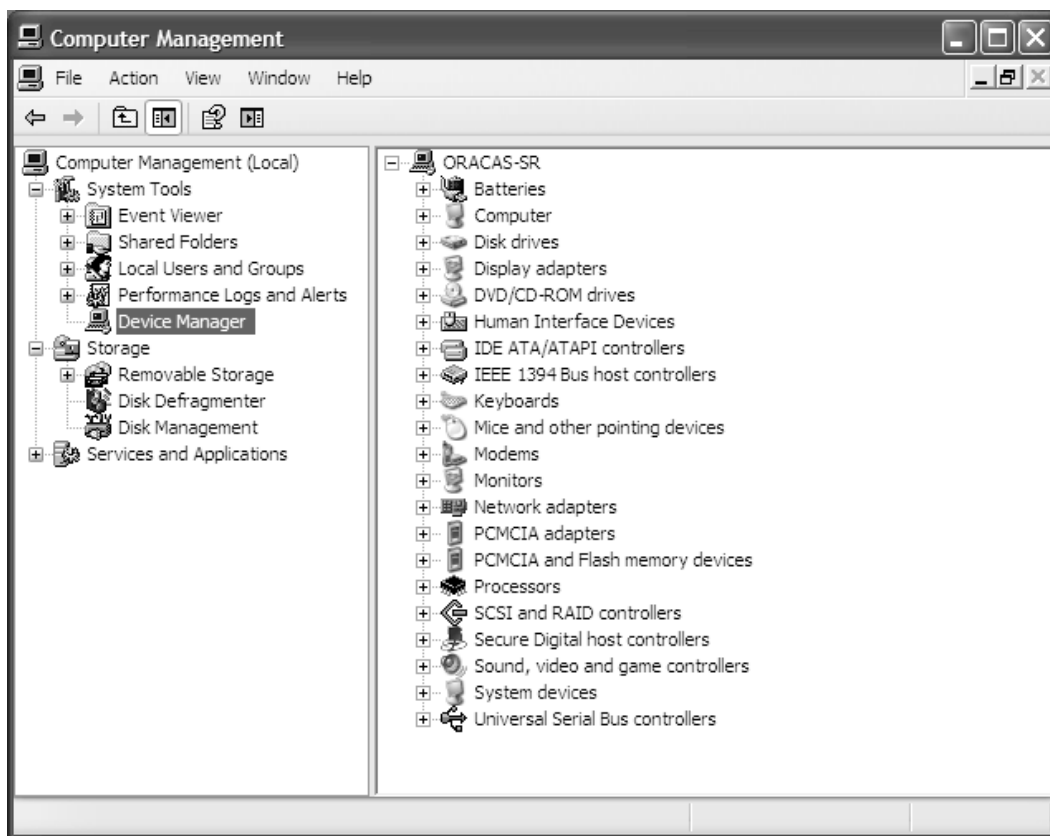
- Installing Device Driver through Device Manager
- Installing Device Driver through Driver Installation Program
- Installing Device Driver through Add/Remove Hardware

Before attempting device detection, ensure that the device is properly plugged in and powered; if not, the device will never be detected. And if the device is not detected, you have to manually load the drivers and configure the device. Loading drivers manually is discussed later in this section.

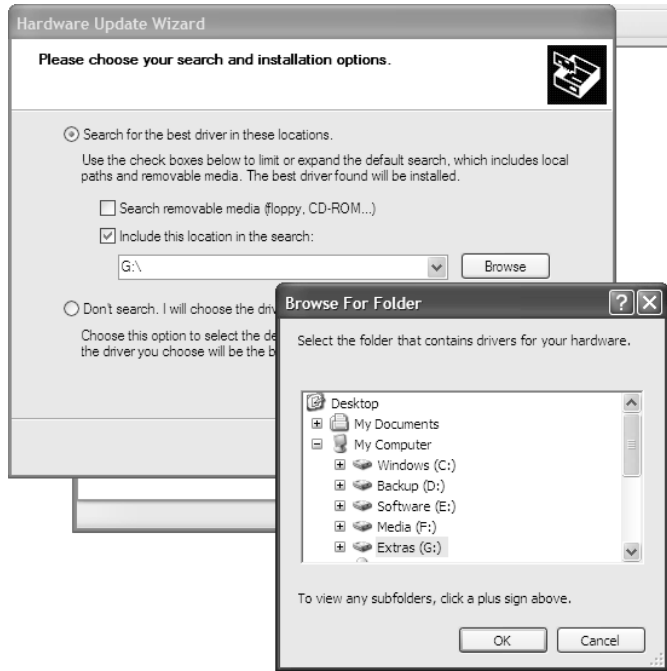
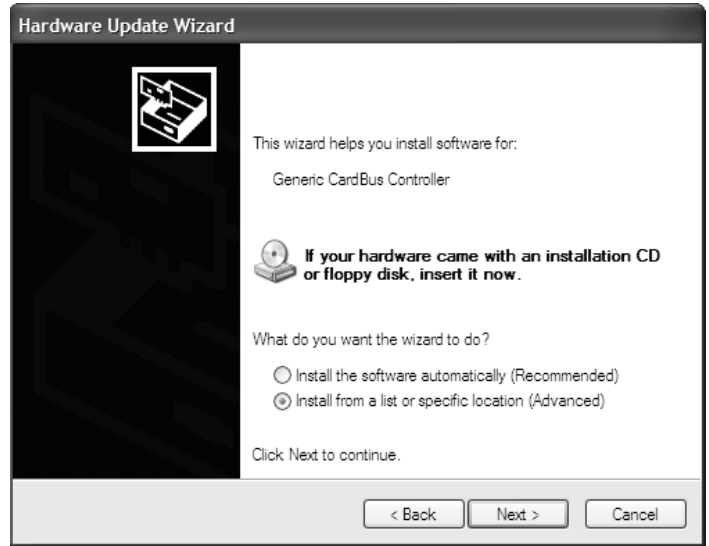
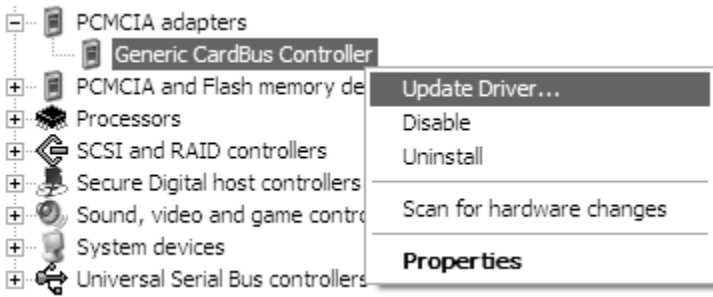
Some hardware manufacturer recommend that you copy their drivers onto your system before connecting the hardware to updates the INF files to acknowledge that this hardware exists. This then allows the device to be properly detected when Windows finds it, allowing Windows to automatically load the drivers.

1. Installing Device Driver through Device Manager

Right-Click **My Computer**, Click **Manage**, highlight **Device Manager**, Choose the **Hardware** category your hardware relates to and click the + symbol next to it.



Now Right-Click the specific device you would like to install the driver for and click **Update Driver**.



In **Hardware Update Wizard** select **Install from a list or specific location (Advanced)** and click next.

In this Windows, select **Search for the best driver in these locations**, uncheck **Search removable media (floppy, CD_ROM...)**, check **Include this location in the search:** and click **Brows**.

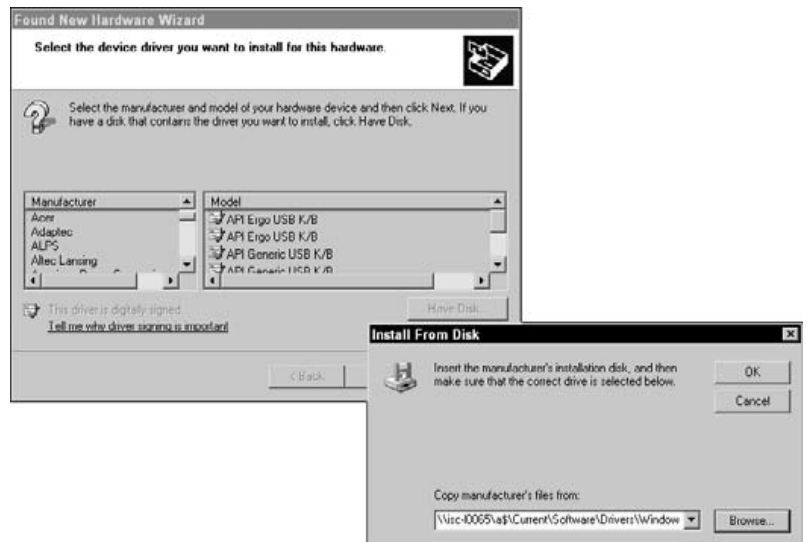
In brows Windows, locate and select driver's path and click **OK** to continue.

2. Installing Device Driver through Add/Remove Hardware

Open the **Add Hardware** applet by choosing **Start-Control Panel-Printers and Other Hardware-Add Hardware**, for classic view of Control Panel, go to **Add Hardware**. When the **Add Hardware Wizard** starts, click **Next**. Indicate whether you already added the hardware to your system; then click **Next**.

If the device that you need to load the drivers for is not listed, choose the option to **Add a New Hardware Device** at the bottom of the list; then click **Next**. You have the option of letting Windows search for new hardware or you can select the hardware from a list. If your computer appears to not be responding, give it some time to finish its detection process.

A screen listing manufacturers and models appears. Choose the manufacturer and then choose a model from that



manufacturer. Click **Next** after making your selection. If the device cannot be matched to known devices, you can click the Have Disk button to browse for or type the location of the device's INF file, as shown in Figure.

Click Next to start installing your hardware. If Windows cannot locate some of the required files, it might ask you to insert a disk with the drivers on it or to locate the files that it needs. Click Finish when the installation is complete.

Signed & Unsigned Drivers

Driver signing was incorporated into Windows starting with Windows 2000 to prevent installing untested drivers on a system. Hardware vendors have an option to send their completed drivers to Microsoft for testing. After testing the driver and confirming that it doesn't have any apparent problems within the OS, Microsoft returns the driver to the vendor with a signature file. This signature file has a .cat extension and contains information about the original driver file to ensure that the driver was not modified since it was sent to Microsoft. When loading drivers, Windows checks for the existence of the signature file. If the signature is not available, you can configure what you want to have happen on the system. Your choices are

- Ignore the missing signature and install the drivers.
- Warn the user of the missing signature, but still give the option of Installing.
- Block the installation of the driver.

Plug and Play

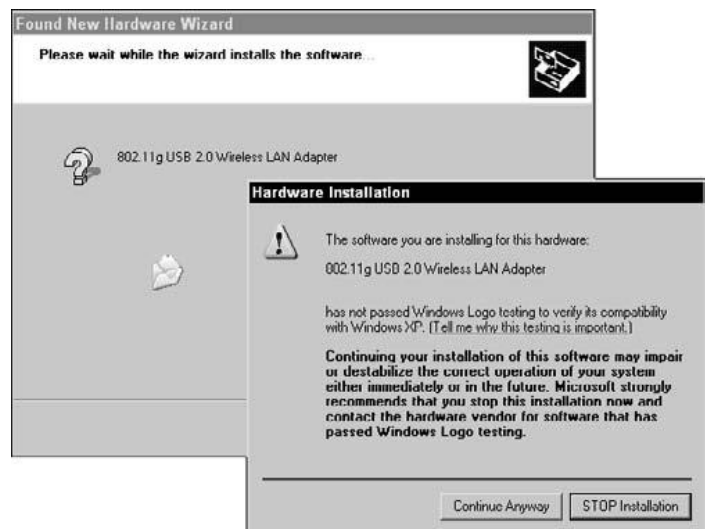
In Plug and Play, you have to do less work to add a device because device identification, driver selection, and hardware configuration are handled by Plug and Play (at least after the device has been added to the driver database).

Device Driver Failure

What do you do if a device driver does not work? This is a question heard many times by users with driver problems. The answer is, as always with computers, "It depends." Some actions that you can take to deal with a malfunctioning driver include

- Upgrading to a newer driver version
- Removing the device
- Rolling back drivers
- Booting to the last known good configuration
- Using restore points

Most important step is, before installing Device Driver, make a system restore point with System Restore.



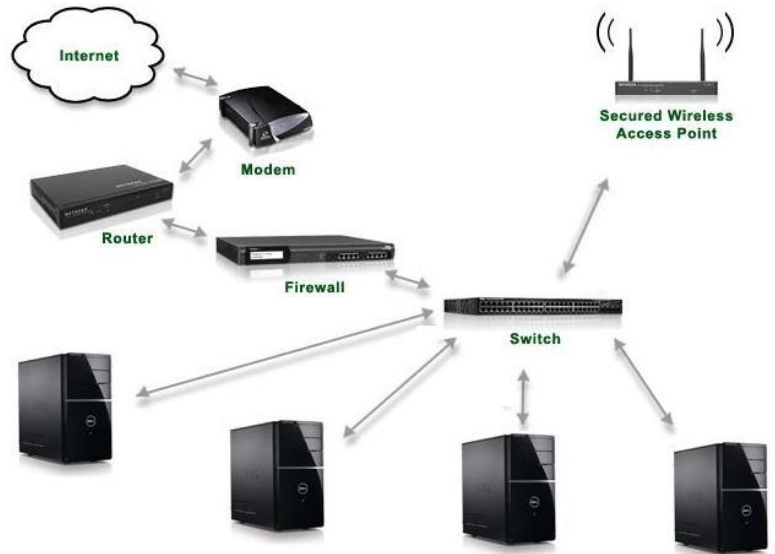
Ch. 7 - Networking

Networks

A network is a group of connected systems for sharing data or devices. This section provides an overview of the two major types of networks: peer-to-peer and server-based (client-server).

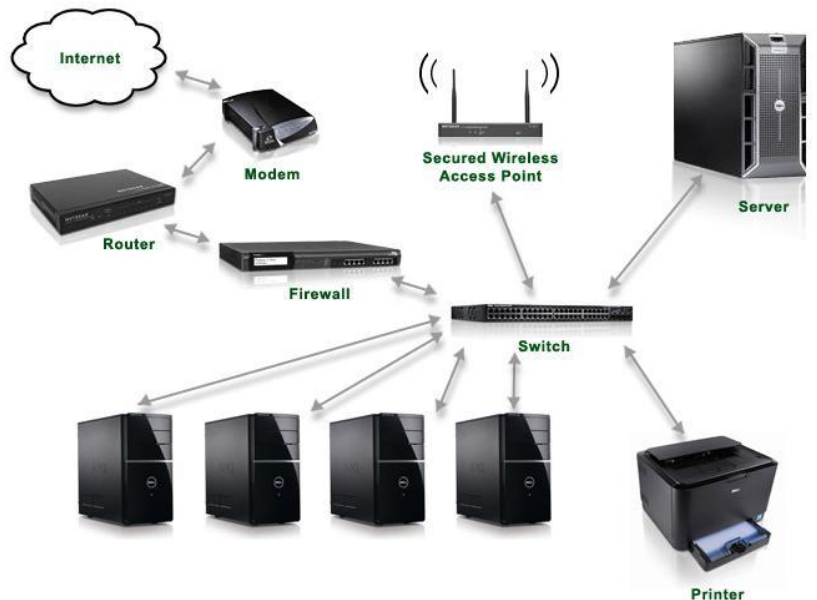
1. Peer-to-peer Networks

In a peer-to-peer (P2P) network, all systems connected to the network can act as clients or servers. A client is a system that makes a request for a resource or service on the network; a server is the system providing the resource or service. In this type of networking environment, all systems are considered equal because they can all play the same roles on the network—either as client or server or as both client and server. The recommended number of systems in a P2P network usually involves ten or fewer systems because of the lack of centralized administration. As a network administrator working in a P2P environment, you will constantly run from machine to machine to perform administrative tasks. Typically, a P2P network involves each system running a desktop operating system, such as Windows XP, to provide network functionality.



2. Server-Based (Client-Server) Networks

Server-based networking, also known as client-server networking, is the networking model that most companies usually choose for ten or more workstations on a network. Unlike a P2P network, server-based networking uses a central machine (the server) that delivers network services to the workstations. Once again, these network services could be services such as file and print sharing, user account authentication, or Web services.



Networking Terminology

Another set of terms you will hear when talking with other IT professionals about network concepts is local area network (LAN) and wide area network (WAN).

A LAN is a network that typically involves one office building, or maybe even networked systems on one floor. Comparatively, a WAN is a network environment that involves connecting two or more LANs. Each LAN typically covers its own building or office location. Companies typically link each

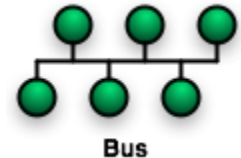
office location to network with the other office locations. Connecting all office locations creates the WAN.

Network Topologies

A network topology is how computers, printers, and other devices are connected over a network. It describes the layout of wires, devices, and routing paths. When building a network, be aware of some upfront decisions regarding the overall network setup. Building a network is like building a database: You have to understand the theory before you start the hands-on work. Topology refers in a general sense to layout; similarly, a network topology defines the layout of the network.

1. Bus Topology

The bus topology was fairly popular in the early years of networking. It's easy to setup- not to mention inexpensive. All devices on the Bus Topology are connected using a single cable. If you need help remembering how the Bus Topology operates, think of it as the route a bus takes throughout a city.



It is extremely important to note that both ends of the main cable need to be terminated. If there is no terminator, the signal will bounce back when it reaches the end. The result: a bunch of collisions and noise that will disrupt the entire network. A bus topology uses a main wire (or trunk) to connect all network devices so that they can communicate with one another. The main trunk is fairly cheap to install but expensive to maintain.

When a workstation sends data to another workstation in a bus topology, data (in the form of an electrical signal) is delivered across the full length of the trunk. Each workstation looks at all data that runs along the trunk. If the data is destined for a particular workstation, that workstation copies the data to the memory on its network adapter.

A terminator is a device that absorbs the electrical signal when it reaches the end of the network trunk. If there were no terminator at the end of the cable, the signal would bounce back in the other direction and collide with any new data being placed on the wire. So, to prevent this crash, the terminator grabs any signals that hit it and ensures that it is absorbed off the wire.

2. Star Topology

One of the most popular types of network topologies today is the star topology. A star topology involves a central component, called a hub (older networks) or a switch (today's networks), which connects all systems and is used to send the electrical signal to all connected systems.



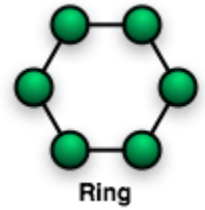
With the star topology, if client A sends information to client D, the information first travels from client A to the hub. The hub sends the information through each port on the hub: as a result, reaching each workstation connected to the hub. Each workstation is responsible for determining whether it is the data's intended destination. When client D receives the data, it checks the destination address of the packet, identifies itself as the recipient of the data, and then copies the data to the network adapter's memory. If the data is not destined for the client, the client simply discards the packet.

Today's networks use switches instead of hubs. Here's an example of how a switch works. When client A sends data to client D, the information first travels from client A to the switch and then the switch forwards the information only to the port that client D resides on. The information does

not get sent to all the clients connected to the switch, like what a hub does. This data path offers performance benefits and also security benefits.

3. Ring Topology

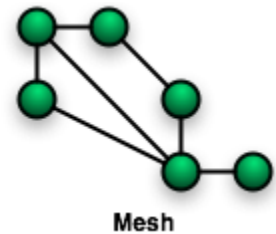
In a ring topology, each computer is connected to the next computer, creating a physical ring. Although ring topologies are not common today, you still see them in IBM's token ring architecture.



In environments that use the ring topology, data is usually passed from workstation to workstation. Because data becomes distorted when it travels great distances, each workstation is responsible for reading the data, regenerating the data, and then passing the information on to the next workstation. Like with a bus topology, any break in the ring causes the entire network to fail.

4. Mesh Topology

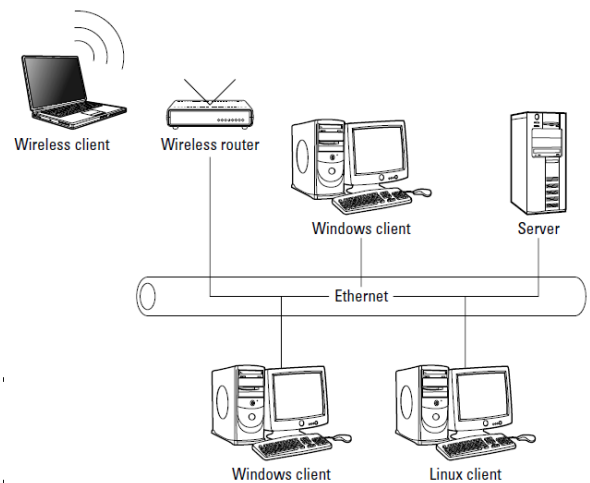
A type of network setup where each of the computers and network devices are interconnected with one another, allowing for most transmissions to be distributed, even if one of the connections go down. This type of topology is not commonly used for most computer networks as it is difficult and expensive to have redundant connection to every computer. However, this type of topology is commonly used for wireless networks.



Wireless Networking

Today's networks allow more mobility for network clients by supporting wireless technologies. To implement a wireless solution, you build a wireless network that uses a wireless topology. A wireless topology typically involves a wired network with wireless clients connecting to the wired network through a wireless access point (WAP), which is a device that sends and receives signals to a wireless client via radio waves.

Notice in figure that the wireless client sends data to the WAP, which has a connection to the wired network. The WAP sends the wireless data to the destination system by sending the signal through the wired media.



Network Cabling

After choosing your network topology, it is time to connect all the network devices together, which means deciding the type of cabling to use. The following sections discuss and evaluate the different types of cabling available for standard networks.

Twisted Pair

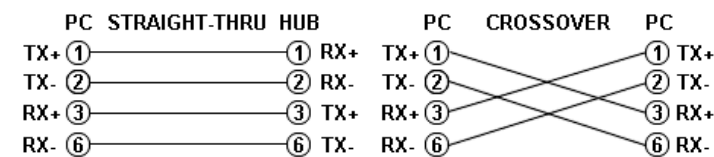
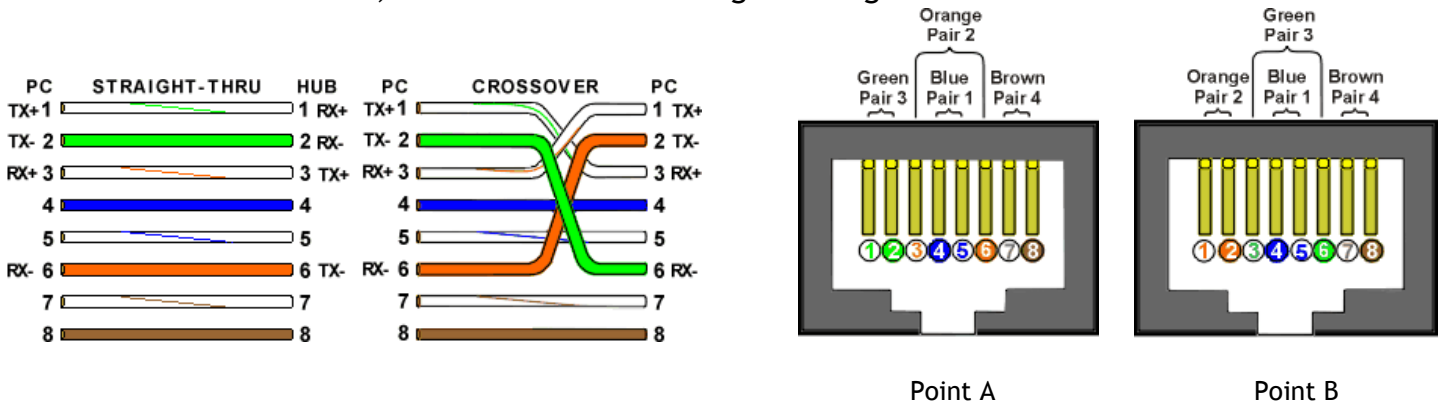
Twisted pair cabling, which is inexpensive and easy to use, is one of the most popular types of cabling used. It gets its name from the fact that it contains four pairs of wires twisted around each other inside the cable's outer jacket. Twisted pair cabling comes in two flavors – unshielded twisted pair (UTP) and shielded twisted pair (STP).



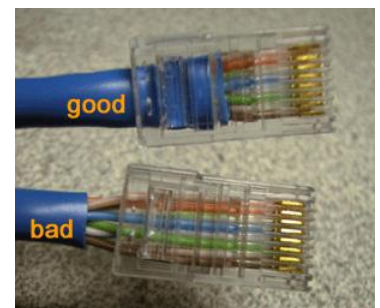
Because twisted pair cabling does not have the layers of shielding found in other forms of cabling, the data is pretty much unreadable – or the integrity of the data is questionable – after 100 meters. For this reason, twisted pair cabling has a maximum length of 100 meters.

Twisted pair cabling uses a special type of connector to connect the cable to the system or network devices. This connector is similar to those used to connect a telephone to a telephone jack. Network devices that use twisted pair cabling use the RJ-45 connector, and telephones use the RJ-11 connector.

Now we will discuss a Crossover network cable. This cable can be used to directly connect two computers to each other without the use of a hub or switch. The ends on a crossover cable are different from each other, whereas a normal 'straight through' cable has identical ends.



TX (Transmitter) pins are connected to corresponding RX (Receiver) pins, plus to plus and minus to minus.



The only difference between UTP and STP is that STP cabling has an extra layer of insulation, which helps prevent interference from outside devices or cabling. Such interference can distort the data traveling along the cable length. UTP comes in a number of different flavors, called grades or categories.

| Category | Purpose | Speed |
|-------------|------------|----------|
| Category 1 | Voice only | |
| Category 2 | Data | 4 Mbps |
| Category 3 | Data | 10 Mbps |
| Category 4 | Data | 16 Mbps |
| Category 5 | Data | 100 Mbps |
| Category 5e | Data | 1 Gbps |
| Category 6 | Data | 10 Gbps |

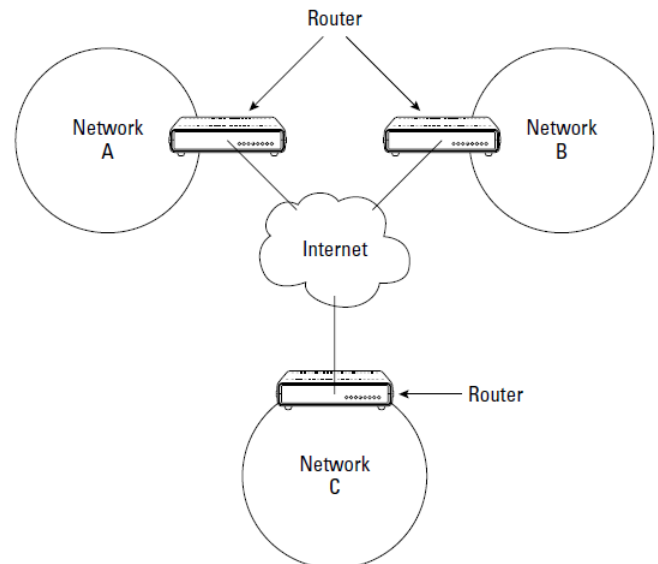
Crimper

You will need a modular crimping tool.



Router

A router, which is responsible for sending information from one network to another, is an important network device because most companies are connected to the Internet. When a computer on your network wants to send information to a computer on another network, your computer passes the information to your router. Figure shows three different networks, each connected to the Internet by a separate router. All computers on network A know that any information with an outside-network destination must be passed to the router because the router is the only device with a physical connection to the outside world.



Gateway

A gateway is a unique network device responsible for converting information from one format to another. Think of a gateway as a translator between two different languages: As information passes from one side to another, the gateway “translates” the information to a format that can be understood on the other side.

Hub

A hub is a central device that acts as a connection point for all hosts on the network. A hub is a very basic device that passes all data that hits the hub to every port on the hub. This means that when a computer sends data to another computer, all systems will see the data on the network even though only the destination system for the data will process the data.

Switch

A network switch is a device that looks similar to a network hub but differs in that the switch does not forward the data to all ports like a hub would. Instead, the switch sends the data only to the port that the destination system resides on.



Wireless Access Point (WAP)

A very popular network component today is a wireless access point. A WAP, typically connected to a wired network, is responsible for accepting data from wireless clients and then passing that data to systems on the wired network. The wireless access point can also receive information from the wired systems and then send that information to the wireless systems.

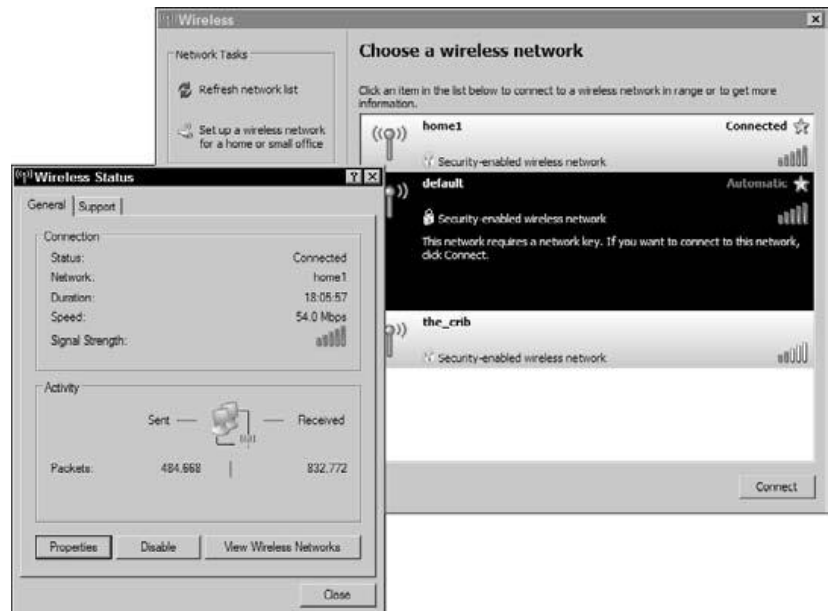
You can find a number of popular brands of wireless access points, such as Linksys, D-Link, and NetGear. Wireless access points that include additional features, such as firewall capabilities, are wireless routers. A wireless router has an antenna that collects the radio waves that carry the data from the wireless client. The wireless router also has a WAN port on it so that you can connect your Internet cable into it and share the Internet connection with all systems on the network. The WAP also has four additional RJ-45 ports to connect four wired systems.



Wireless Network

The two main components of wireless networks are clients and access points. Clients are computers with wireless network cards; these cards work just the same as wired network cards, but without the wires. Access points, which act as a consolidation point for multiple wireless clients, have a connection to a traditional wired network. Some new access points allow linking multiple access points through wireless links.

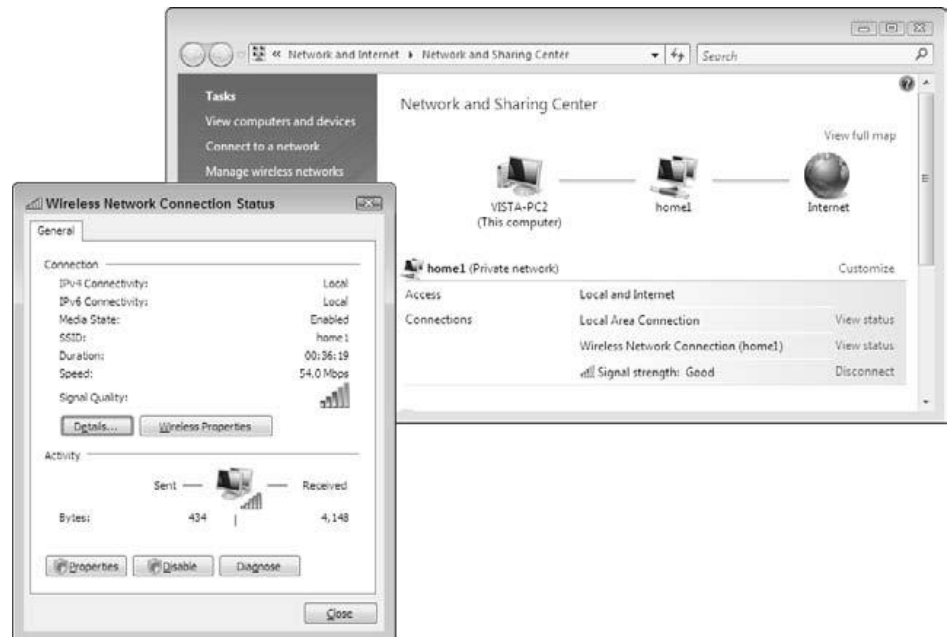
If you use the default Windows XP software, open the Network Connections folder and double-click your wireless network card to open the Wireless Status dialog box. This gives you information about your current wireless connection, including connection speed, SSID, and signal strength.



If you use the default Windows Vista software, open the Network and Sharing Center and click the View Status link next to your wireless card. This provides you with the same information that you would see with Windows XP, such as connection speed, SSID, and signal strength.

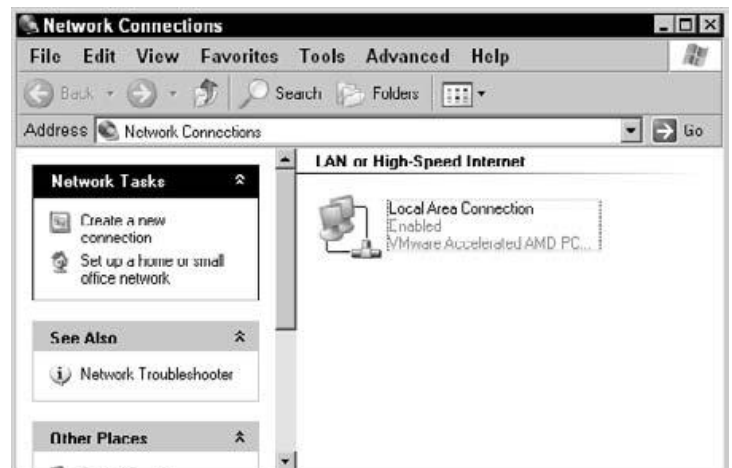
DHCP Server

A DHCP (Dynamic Host Configuration Protocol) server provides automatic TCP/IP configuration to network clients by changing normal items that DHCP provides, such as a default gateway or DNS settings for name resolution, or by disabling DHCP altogether. By failing to distribute accurate TCP/IP information to unwanted visitors, and using manual TCP/IP configurations to users, you are implementing another rudimentary security step.



The Local Area Connection

After you load the network card driver, Windows creates an icon that represents the network card; this icon is called the local area connection. If you have multiple network cards installed, you have multiple local area connections – one representing each network card. The purpose of the local area connection icon is to give you a place to configure any network settings responsible for communication between the network card and the local area network (LAN). For example, if you want to ensure that TCP/IP is used by your network card, right-click the local area connection and choose Properties. In the Properties of the local area connection, you can add or configure networking components, such as TCP/IP. To view your LAN connections in Windows XP, choose Start-Control Panel-Network and Internet Connections-Network Connections. You see a window that displays your local area connection icon, as shown in Figure.



When you right-click the local area connection icon, its contextual menu gives you a number of tasks. Here are tasks that you might use when you troubleshoot networking issues:

- **Disable:** Temporarily cut off communication to and from the network. This is a quicker solution than physically removing the network card from the computer.
- **Enable:** After you troubleshoot your network and you need to re-enable the network connection, choose Enable.
- **Status:** Display a dialog box showing how long the connection has been up and running and also the speed of the connection. On the Support Page tab, you can view your IP (Internet protocol) address information and MAC (Media Access Control) address.

- **Repair:** Have Windows perform maintenance on the connection by performing tasks such as renewing your IP address, flushing the ARP (Address Resolution Protocol) cache, and flushing the NetBIOS and domain name system (DNS) resolver cache.
- **Rename:** Give the connection a more meaningful name.
- **Properties:** In the Properties dialog box, you can modify the network setup of the network card.

Networking the Operating System

When setting up a network, you must have the appropriate hardware and software in place to allow systems to communicate with one another. Because this chapter focuses on the software components needed to allow Windows to network, you can assume that you have all the necessary hardware in place. You have a hub or switch, at least two computers and network cards to go in the computers, and the appropriate cabling to connect the network cards to the hub/switch is already connected. After all the hardware is in place, consider what you have to do at the operating system level to get these computers talking. Not only do you need the physical hardware in place but you also need to load software components, such as a network card driver, protocol, service, and client software. These are the four major software components required to network.

When building your network, it is important to identify the four major software components that allow a Windows OS to function in a networking environment:

1. Network client

A network client is no different than a client or customer in the real world. A client in the real world visits your company because you provide some sort of service. On your computers, you must run a client for the type of service you are requesting on the network. For example, if a company runs Novell NetWare as the server OS, you must load a client that will connect your computer to the Novell server. Or, if you want to connect to a Windows server, you have to load a Microsoft client on your system. The Windows OS come with the Client for Microsoft Networks already installed so that you can automatically connect to a Windows network.

2. Protocols

Protocols are languages used to hold a conversation on a network. Your system can have a network card installed and have the proper client running, but if it is not speaking the same language as the remote system, the two systems cannot hold a conversation.

Transmission Control Protocol/Internet Protocol (TCP/IP) is the hot protocol on the market these days because it is the protocol of the Internet and Internet-based technologies. TCP/IP has become the protocol of choice for Windows, Linux, and Novell networks because of its ability to communicate in various environments. The bottom line is this: It doesn't matter what kind of OS you are running – if you're running TCP/IP, you can communicate globally.

3. Services

One of the most networking components is the service, which is a piece of software running on the computer that provides certain functionality. An example of a service that runs on the computer is file and printer sharing, which is the service that provides files, folders, and printers to other systems on the network. Windows and Novell servers usually run at least two services by default:

- File Sharing Services: Allow the server to share files with other users on the network.
- Printer Sharing Services: Allow a printer to be used by multiple users on the network.

The TCP/IP Protocol

Since the dramatic growth of the Internet, TCP/IP has become the ideal protocol on networks today. TCP/IP is the common protocol on all desktops – including Windows, Linux, and Macintosh systems – allowing all these different OS to communicate over a common protocol. To troubleshoot communication across TCP/IP, you need to understand the types of settings that need

configuring. In the sections that follow, you look at how to configure TCP/IP and at some utilities to help you troubleshoot the protocol.

1. IP Address

The IP address is a 32-bit number that is unique to your computer. No two systems can have the same IP address. An IP address is similar to the address of your home, which is the method by which other people send mail to you. An IP address works the same way on a TCP/IP network: You will assign the number to your computer, and it is the method other computers use to send information to your computer. An IP address is made up of four sets of numbers separated by periods: dotted decimal notation format. Here's an example 192.168.1.2 each of the four sets of numbers an octet (because each octet represents 8 bits of data). The IP address comprises a network ID and a host ID:

- **Network ID:** This unique number is used only by your network and is also the same for all computers on the same network. For example, in the IP address 192.168.1.2, the first two octets (192.168) make up the network ID. So if computer A with an IP address of 192.168.1.2 talks to computer B with an IP address of 192.168.1.3, you can assume that the two computers are on the same network because 192.168.x.y is the network ID for both computers.
- **Host ID:** This portion uniquely identifies a computer on the network. For example, in the IP address 192.168.1.2, the last two octets (1.2) make up the host ID. Only one computer on the 192.168.x.y network can have the host ID of 1.2 any address starting with 127 is illegal because this address is reserved for the loopback address, typically, the loopback address is referred to as 127.0.0.1, but you could use any address that starts with 127.

2. Subnet Mask

Another way to tell whether your computer is on the same network as the computer you are trying to communicate with is to look at the subnet mask. The subnet mask is what your computer uses to determine whether the network device it is trying to communicate with is on the same network. The subnet mask helps the system determine the network ID portion of the IP address by comparing the subnet mask against the IP address. If there is a 255 in the subnet mask, the corresponding octet in the IP address is part of the network ID. After the network ID is known, any systems that have the same network ID are considered to be on the same network; otherwise, they would have a different network ID.

3. Default Gateway

When information has to be forwarded from a computer on one network to a computer on another network, a special network device called a router must be used. The router has a table that lists all the networks it knows about and the network ID associated with each of those networks. When the router receives information destined for a particular IP address, it checks its table of network IDs for a match. If a match is found, it delivers the information to the appropriate network. The default gateway is a TCP/IP option configured on each workstation. Typically, all computers on the same network point to the same router.

NAT (Network Address Translation)

Home routers use the Network Address Translation (NAT) technology. The router is a NAT device, and a NAT device has two network cards: one connected to the Internet and one connected to the inside network. Your client systems use the NAT device (the home router) as their default gateway. The NAT device converts the private address being used as the source IP address of the packet to

the public address assigned to the WAN interface on the NAT device. As a result, the packet looks like it is coming from the WAN port of the NAT device, which is actually using a valid public address. When the reply comes back, the NAT device translates the address back to the private address and then sends the packet to the client system inside the network. This is completely transparent to the clients on the network. One benefit of NAT is that you can share the one public IP address assigned by your ISP to the WAN port on the router, so allowing you to have multiple computers on your home network surfing at the same time. Another benefit is a security benefit: that is, your internal network structure is hidden from the outside world. From the Internet's point of view, the system surfing the Web is the NAT router. If nefarious folks decide to attack that address, they are attacking the NAT device – and not the IP of a machine on your network.

Troubleshooting with TCP/IP Utilities

After you have TCP/IP installed and configured and you have your TCP/IP network running, you need to be able to troubleshoot the network. When problems arise on a Windows network, you can use some of the following commands to do your troubleshooting:

IPCONFIG

On Windows systems, you can run the ipconfig (IP configuration) utility, which shows you the current TCP/IP configuration of the Windows desktop, such as the IP address, subnet mask, and default gateway. If the computer is a DHCP client, ipconfig identifies the server that has given the IP address and also shows how long the IP address will be used by the client.

| | |
|-------------|----------------------------------------------------------------------------------|
| /all | Shows all TCP/IP information – for example, DHCP lease period and the DNS server |
| /release | Releases the current IP address information assigned by the DHCP server |
| /renew | Requests new IP address information from the DHCP server |
| /displaydns | Displays the DNS resolver cache which stores recent results from DNS queries |
| /flushdns | Clears the DNS resolver cache |

PING

One of the most popular TCP/IP utilities is the ping.exe utility. Ping (Packet Internet Groper) is used to test whether your computer can communicate with a remote network device. If the ping test is successful, you get a ping response from the remote device; if it is not successful, the response will time out. The general syntax for using the ping utility is ping <IP address>, the IP address being the IP address of the network device you are testing.

NETSTAT

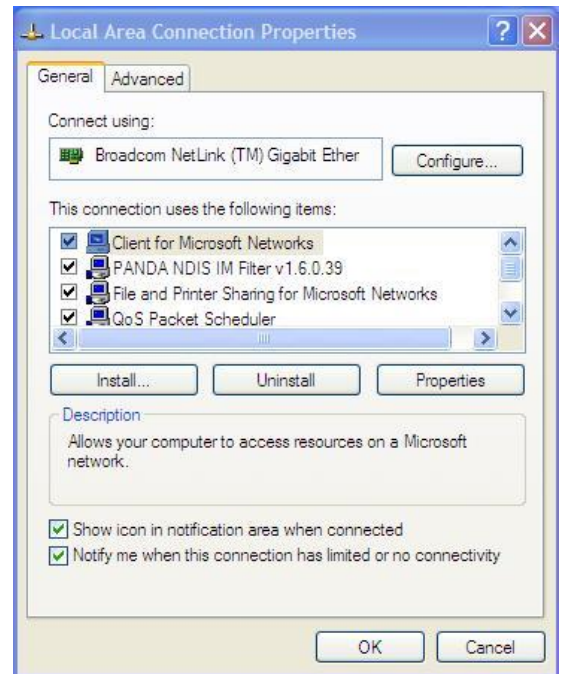
The netstat command line utility is used to troubleshoot TCP/IP connections. If you use the netstat command by itself, it displays a list of connections that your system has with remote systems and the associated ports.

| | |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -a | Displays all connections that your system has but also all listening ports. A port is what an application uses as an endpoint of communication. For example, applications such as Internet Explorer use a port, and that port is where a Web server sends the data so that the data reaches Internet Explorer. |
| -o | Displays the process ID of the application that opened the port. |
| -p | Protocol, Shows the connections for the protocol provided to the switch. For example, you could use netstat -p tcp to view all the TCP connections. |

Enabling File and Printer Sharing in Windows

Now that you understand the two levels of access control, you are ready to allow your Windows machines to share resources on the network. First, you must ensure that File and Printer Sharing Services are installed and that File and Printer Sharing is enabled. Then you can start sharing folders and printers. All Windows OS have File and Printer Sharing enabled by default. To verify that File and Printer Sharing is enabled within these operating systems, perform the following steps:

1. Windows XP/Server 2003: Choose Start-Control Panel-Network and Internet Connections-Network Connections, for Vista, click Start, Right-click Network and choose Properties. Click the Manage Network Connections links on the left.
2. Right-click your local area connection and choose Properties.
3. Select the File and Printer Sharing for Microsoft Networks check box, and then click OK. When this check box is selected, File and Printer Sharing is enabled, and you're finished. If File and Printer Sharing for Microsoft Networks wasn't listed, you need to install it first, so keep reading.
4. If File and Printer Sharing isn't listed, click the Install button to install the service. Choose Service in the Component Type dialog box and then choose File and Printer Sharing for Microsoft Networks. Then click OK to close all the dialog boxes.



Creating shared folders

When a user on the network wishes to access a file on another system, he must connect to a share on that system. Shares are a way to publish the folder on your system for other users on the network so that they can access the files in that folder. If you have not shared any resources, there is no reason for anyone to want to connect to your computer – it would be like giving someone the key to a locked but empty room. You can share only folders or printers; you cannot actually share a file specifically. To allow users to access a file from across the network, you have to place the file in a folder and then share that folder. Right-click the folder and choose Sharing and Security. On the Sharing tab, choose the Share This Folder on the Network option.

Network Setup Wizard

The Network Setup Wizard sets the proper permissions on shared folders, adds required keys to the registry, configures protocols and binds them to network cards, enables or disables the Internet Connection Firewall, and adjusts system policies so that file sharing works properly over the network. You should run the Windows XP Network Setup Wizard on every system that's connected to your network. Doing so is the only reliable way to ensure that your network has the proper baseline configuration. Afterward, you can manually adjust settings and enable or disable features as required.

To start the Network Setup Wizard, open Control Panel, double-click Network Connections, and then click the **Set up a Home or Small Office Network** link under Network Tasks in the left pane. This choice is also available in the My Network Places folder or Start-Run and type **netsetup**.

If the wizard informs you that it has found disconnected hardware, make sure your network adapter is connected as described in Add a computer to your network. It's okay to have a disconnected network adapter if you're using a wireless network connection. Select Ignore disconnected network hardware. Otherwise, connect your network cables, and leave the check box cleared. Then click Next.

If you connect your computer directly to the modem provided by your ISP, click **This computer connects directly to the Internet**. If you connect your computer to a router, click **This computer connects to the Internet through a residential gateway**. If you're not sure, leave the default setting. Then click Next. If the Select your Internet connection page appears, click Next.

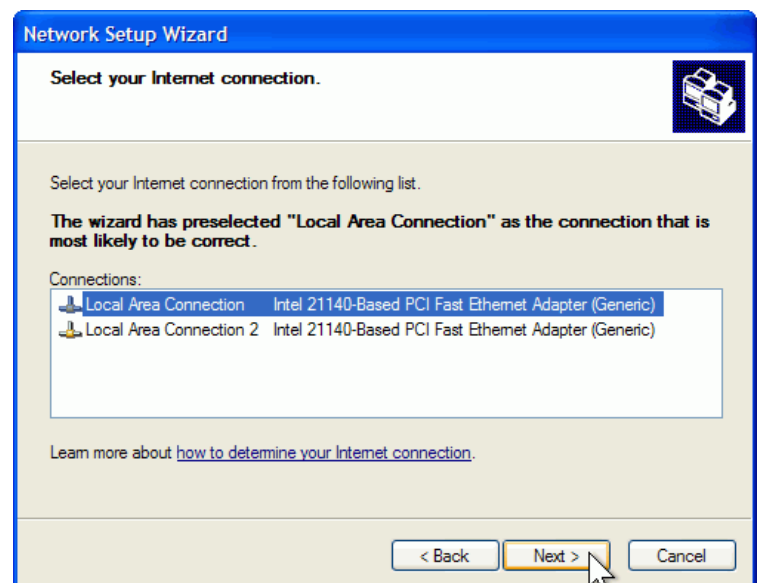
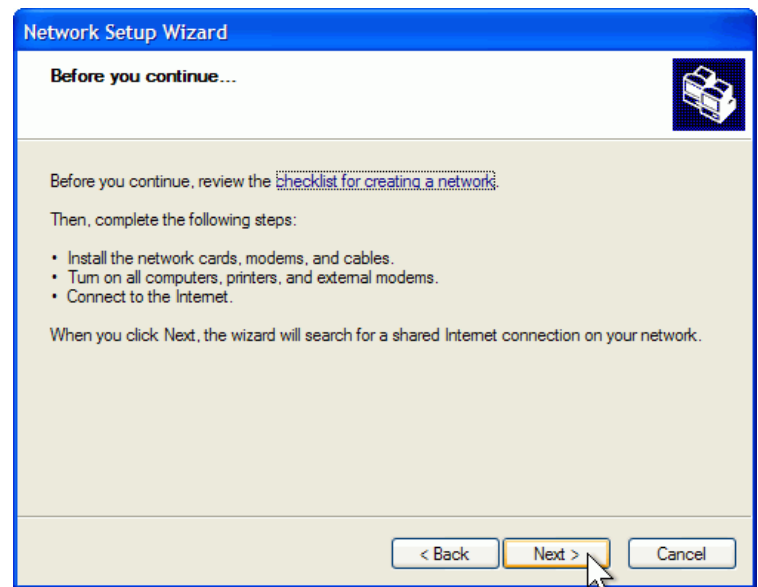
On the Give this computer a description and name page, type a computer description (such as "Kid's Computer") and computer name (such as "Desktop"). Click Next.

On the name your network page, type Workgroup name. Then click Next.

Note: Workgroup name must be same in all computer of network.

If you have files or a printer that you want to share with other computers on your home network, select **Turn on file and printer sharing**. Otherwise, leave **Turn off file and printer sharing selected**. Then click Next.

On the **Ready to apply network settings** page, click Next. The **Network Setup Wizard** sets up your computer.



On the **You're almost done** page, click **Just finish the wizard**. Then click Next. On the **Completing the Network Setup Wizard** page, click Finish. When prompted to restart your computer, save any open files, and then click Yes. After your computer restarts, you'll be connected to the network with the settings you provided.

Installing a Network Printer in Windows

To print, or connect, to a shared printer out on the network, you have to install a network printer on your Windows client that points to the UNC (Universal Naming Convention) path of the shared printer. A network printer in Windows is a printer installed that refers to a shared printer on the network. When you print to a network printer, the print job is sent to the computer that has the printer installed and prints from the print device connected to that system.

Ch. 8 - Working with Devices

1. Printers

In today's business world, maintaining a printing environment is one of the most time-consuming parts of managing a network. For a supposedly paperless era, we seem to spend a lot of time troubleshooting why a printer won't print! This chapter introduces you to the different types of printers and describes how each type of printer works.

Laser Printers

The laser printer — also known as a page printer because it prints one page at a time — is the most popular type of printer because it is fast and reliable, and offers the best-quality printout of the three types of printers.

Toner cartridge

The toner cartridge contains the replaceable components of the printing process. It contains three core components:

The toner is electrically charged material made of color (to give it its color) and plastic (so it can be melted to the page) that is attracted to the paper to create the printout.

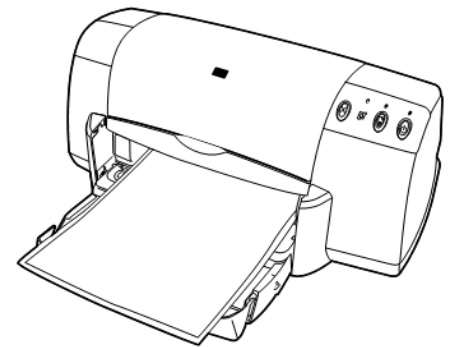
The print drum holds an electromagnetic charge when exposed to the laser. That charge then attracts the toner to the page.

The cleaning blade cleans excess toner off the drum after the print process has completed.



Inkjet Printers

Inkjet printers offer the next highest level of print quality and are relatively cheap compared to laser printers. Inkjets are great for home use or small office environments that don't have large print jobs. It doesn't use toner like a laser printer; instead, they use ink cartridges. The ink cartridge contains all the working elements needed to get an image from the computer onto a sheet of paper. It contains compartments of ink, each sealed with a metal plate to prevent ink leakage. Each compartment has a tiny pinhole from which the ink is sprayed from the cartridge onto the paper.



Color inkjet printers are very popular today because of the increased popularity of digital cameras. Color inkjet printers can require two cartridges: one for black ink and one for the colors (cyan, yellow, and magenta). Most inkjet printers today have cartridges that bundle the black ink with the other colors. These cartridges are called CMYK (C for cyan, Y for yellow, M for magenta, and K for black).

Dot Matrix Printers

Dot matrix printers are considered impact printers because they physically strike an inked ribbon with a metal pin to put characters on paper. A dot matrix printer fires off rows of pins that strike the ribbon in patterns to create the image or characters that need to be printed.

Each pin – a solenoid – is wrapped in a coiled wire held in place with a spring and small magnet. When a solenoid is needed to help create the image by striking the ribbon, an electrical charge is sent down the coil wire that surrounds the solenoid. The electrical charge around the wire causes the magnetic field from the magnet to be lost, resulting in the pin firing against the ribbon.

The solenoids are contained in the print head, which moves across the paper printing one line of dots at a time. Originally, dot matrix printers used only nine pins in the print head. The 9-pin dot matrix printers were known as draft-quality printers and were later replaced by 17 and even 24-pin dot matrix printers. The quality of the 24-pin dot matrix was much better than that of the 9-pin because the greater number of dots creates a finer image.

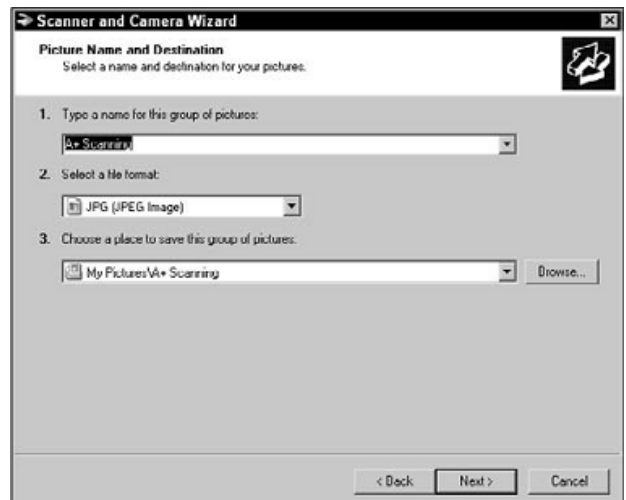
2. Scanners

A few years back, scanners were very popular because they were one of the only ways to get your photos into a digital format. Maybe you wanted to use the computer to alter the photo or to send it to a relative via e-mail. To do any of these actions, you had to use a scanner, which would copy the photo as a digital image that could be saved on your computer.

Scanning an image

1. Choose Start-Control Panel-Printers and Other Hardware-Scanners and Cameras.
2. To scan an image, select your scanner and click Get Pictures on the Imaging Tasks pane on the left side of the screen.
3. Click Next on the wizard's welcome screen.
4. If you want the scan in color then choose color picture and then click Next.
5. Type the name for this group of pictures.
6. Select which graphics file format you would like to save your pictures in.

The steps to scan a document in Windows Vista you will navigate to the list of scanners by choosing Start-Control Panel-Hardware and Sound-Scanners and Cameras.



3. Digital and Web Cameras

Photography has changed dramatically since then. Today, you can use a digital camera, which stores the picture in memory on the camera, not on film. You can also navigate through the pictures by using the built-in viewer on the camera and then delete the ones you do not like – then print only the ones you want developed! The following sections introduce you to digital cameras, digital video cameras, and Web cameras (Webcams).

I. Digital Cameras

A digital camera is different from a conventional camera because instead of storing the image on film, a digital camera stores the image as a digital file on the camera. This file can then be uploaded to a computer and can be used in any application on the computer, such as e-mail, presentation software, or a photo editor. When shopping for a digital camera, you want to be sure you get the best camera. The quality of a digital camera is measured in its resolution and zoom levels.



Resolution

Camera resolution is measured in pixels, just like monitor resolution. The more pixels recorded in the photos being taken, the more detail displayed in the picture. The resolution also affects how large the picture can become before becoming rough. A camera advertises its resolution by indicating how many pixels it supports, which is typically measured in Mega Pixels (MP; or millions of pixels). The higher the number of pixels supported the better quality image you will get from your camera. Here are what some common cameras resolution translates into:

- 1MP : Supports an image resolution of 1216 x 912
- 2MP : Supports an image resolution of 1600 x 1200
- 4MP : Supports an image resolution of 2240 x 1680
- 5MP : Supports an image resolution of 2560 x 1920
- 6MP : Supports an image resolution of 2816 x 2112
- 8MP : Supports an image resolution of 3264 x 2448
- 11MP : Supports an image resolution of 4064 x 2704

Zoom

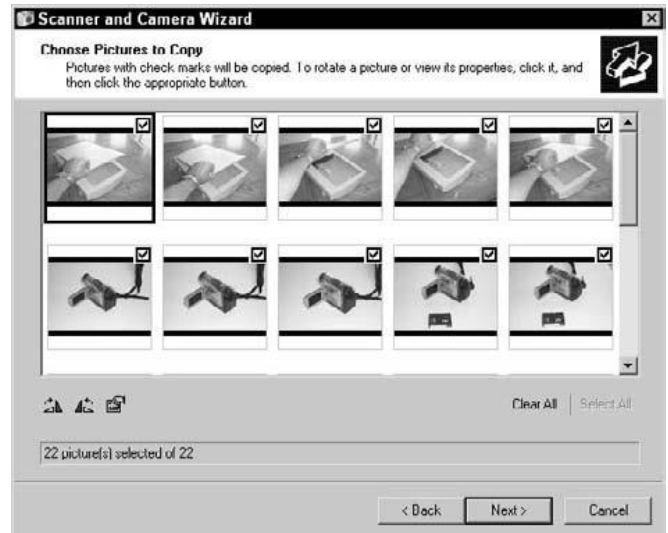
Digital cameras can have two types of zoom, optical and digital, both of which let you zoom in on your subject when taking a photo. In the following list, optical and digital are compared against what is known as fixed focus:

- Fixed focus: A fixed focus camera does not support any type of zooming features. What the camera sees is what the camera takes as a picture. To zoom in, you need to physically get closer to the object. This is the zoom type used on disposable cameras.
- Optical zoom: Optical zoom is the “good” zoom type that uses lenses on the camera to change the focus and zoom in on the object. This zoom type does not change the image in any way: It simply zooms in and takes the picture.
- Digital zoom: Digital zoom is what I like to refer to as a virtual zoom. It takes the picture and then goes to the center of the image and magnifies the subject. This is the same as you taking an original photo into a photo editor and magnifying the image and then cutting to the part you like.

Uploading pictures to the computer

To upload pictures from your digital camera in Windows XP, follow these steps:

1. With your camera powered-off, plug the camera into the computer's USB port; then turn on the camera. The digital camera uses a dedicated USB cable that has a USB connector on one end to connect to the computer while the connector on the other end is a small connector for that camera. Windows detects the camera, loads the driver for the camera, and then asks which program you want to use to copy your photos to the system.
2. Choose Microsoft Scanner and Camera Wizard and then click OK.
3. When the Camera Wizard displays its introduction screen, click Next. You are presented with a list of photos that can be uploaded.
4. Make sure that a check mark appears beside each photo you want to upload and then click Next.



The steps to upload pictures from your digital camera are similar in Windows Vista – you simply plug the camera into the computer and power it on and the Autoplay window in Vista will appear asking how to upload the pictures. If you choose Import Pictures, the import pictures wizard will launch asking you to tag a name to this group of pictures and then copies the pictures to the system.

II. Web Cameras

Web Cameras (also called Webcams) can capture video and display it on the computer screen, or they can be used to record a video and store it in a digital format on the computer. Webcams are popular with conferencing applications, which allow you to have a live conversation while seeing the person you are talking to, over the Internet.

A Webcam is typically shaped like an eyeball with a lens on the front and connects to the system's USB port. Most Webcams have a stand that holds the camera and allows it to sit on the monitor or desk.



III. Digital Video Cameras

A Digital Video Camera can record directly to the computer and store the video as a file on the computer, or it can store the video to memory on the camera. It can also store the information to a digital video tape that can then be played later and recorded on the computer as a file. A Digital Video Camera typically connects to the computer via a USB 2.0 or IEEE 1394 (FireWire) connection, which is currently the more popular choice.

Digital video file sizes are kept to a minimum by compressing the video using special Compression/Decompression (codec) software. There are a number of different types of video formats and codecs, the most popular of which are:

- **DV:** Digital Video cameras have their own proprietary format to store the video, known as the DV format. The DV format typically has no loss in quality.
- **DivX:** DivX is one of the most popular codec types today. It supports high-quality video with high compression ratios. A video using the DivX codec uses only about 15 percent of the disk space that other codec types do.
- **MPEG1:** MPEG1, developed by the Moving Picture Experts Group, has been used heavily for creating videos to be distributed over the Internet because of its small file sizes and because only the codec is needed to play the video back.
- **MPEG2 and MPEG4:** The MPEG1 video compression has been improved again and again to create the MPEG2 and MPEG4 compression standards, which have better compression rates and better resolution.

Ch. 9 - Understanding Windows & Network Security

One of the most important skills to have if you are going to support networked systems or systems connected to the Internet is the capability of securing systems and networks. And even if you are not working in a networked environment, you can apply these same skills to your customers with home Internet machines. The bottom line is that you need a solid understanding of network security.

The Hacker

A programmer who breaks into computer systems in order to take or change or destroy information as a form of cyber-terrorism, called Hacker. A hacker is someone with the technical expertise to bypass the security of a network or an OS. A hacker knows how to use features of a piece of software or hardware to gain access to restricted areas of a network and then how to use those features against you and your system. For example, most Web sites connect to a database behind the scenes so that you can get a list of products when you visit their site. A hacker knows how to input data into the site to control your database server into executing the code that the hacker wants to execute – and this happens because the hacker understands the technologies being used.

Virus

A virus is a program that causes harm to your system. Typically, viruses are spread through e-mails and are included in attachments, such as word processing documents and spreadsheets. The virus can do any of a number of things: delete files from your system, modify the system configuration, or e-mail all your contacts in your e-mail software. To prevent viruses, install antivirus software and do not open any file attachments that arrive in your e-mail that you are not expecting.

Worm

A worm is a virus that does not need to be activated by someone opening the file. The worm is self-replicating, meaning that it spreads itself from system to system, infecting each computer. To protect against a worm, you should install a firewall. A firewall is a piece of software or hardware that prevents someone from entering your system.

Trojan horses

Trojan Horse

A Trojan horse is software that a user is typically tricked into running on the system; and when the software runs, it does something totally different than what the user expected it to do. For example, NetBus (an older attack) is an example of a Trojan horse program sent as a file called patch.exe. The user receiving the file, typically through an e-mail, believes that the file will fix a security issue. The problem is that patch.exe is a Trojan horse, and when that horse starts running, it opens the computer up to allow a hacker to connect to the system.

Logic Bomb

A logic bomb is malicious software that could run every day, but the software was designed to wreak havoc on your system on a certain date and time. The scary thing about logic bombs is that they seem like useful software until the day the programmer decides it will become malicious! To protect against malicious software such as a virus, Trojan horse, worm, and a logic bomb you should use a firewall and keep your virus definitions up-to-date.

Implementing Security

When thinking about network security, understand that security is to be implemented at multiple layers, meaning that you cannot focus on just one security-related feature. You want to implement multiple security features to secure your environment.

1. Antivirus

Using antivirus software is another security best practice. Ensure you are using antivirus software on all your systems and keep the virus definition database up to date! Antivirus software is designed to protect your system against viruses. You can choose from many different name brands of virus-protection software, each of which has its own benefits. Some of the popular names in virus protection are

- Norton
- Panda Security
- TrendMicro
- McAfee
- KesperSky

Each antivirus software product has its own benefits and features. When shopping for antivirus software, you should look for software that offers at least the following features:

- **Scheduled virus scans:** This is a great feature because you can have the virus scanning software scan the system in the middle of the night (when the system is not being used), and you do not have to physically perform the scan yourself. You may also choose what happens when a virus is found: say, attempt to remove the virus from the file, place the file in a **Quarantine** area, or delete the file.
- **Real-time protection:** The virus protection software runs in memory all the time and scans any file that you open. The benefit of real-time protection is that you are protected from viruses between scan times. Be sure to have software that supports real-time protection and have the feature enabled!
- **Scheduled definition updates:** Virus definitions are what virus protection software uses to update its knowledge of viruses. Your virus protection software should have a feature that allows the definitions to be downloaded from its vendor site.
- **Scanning e-mail:** Many virus protection software versions support scanning e-mail messages as they arrive in your inbox. This is typical of virus protection software that runs on an e-mail server and you usually pay an annual subscription fee for the service.

Updating virus definitions

When you perform a virus scan, your virus protection software knows only about the viruses as of the creation time of the software. This is a huge problem because new viruses appear every day, to keep your software valid and to allow it to still be useful years after you purchase it, manufacturers use virus definitions as a way for the software to know the current list of viruses. The virus definitions can be updated online. So, even though your software might be two years old, you can keep it current.

2. Spyware and Adware

Spyware is that loads on your system and then monitors your Internet activity. Adware is software that creates pop-ups from time to time advertising a particular product or service. Both types of viruses infect your system when you surf the wrong Internet site. Spyware and Adware have become a huge negative result of the Internet, so a number of products are available to eliminate Spyware and Adware. The most popular products used to eliminate Spyware and Adware are:

- Spy Sweeper
- Spyware Doctor
- Ad-Aware
- Microsoft Windows Defender
- Spybot Search & Destroy

3. Malicious Software

Other types of malicious software, outside of your typical viruses, attack systems every day. The following sections outline other types of malicious software – but understand that they are all considered types of viruses.

Malicious software (Malware) is any software that gives limited to full control of your computer to do whatever the Malware creator wants. Malware can be a virus, Worm, Trojan, Adware, Spyware, etc. The damage done can differ from something slight as changing the author's name on a document to full control of your machine without your ability to easily find out. Most Malware requires the user to initiate its operation. Some vectors of attack include attachments in e-mails, browsing a malicious website that installs software after the user clicks ok on a pop-up.

4. Pop-ups and Phishing

To help protect your system from malicious activity when surfing the Internet, newer versions of Internet Explorer (IE) have built-in pop-up blockers and prevent phishing attacks. Windows Vista has these features enabled by default, protecting you from malicious content on the Web! If the site is a known phishing site, the browser will block the site.

A pop-up blocker prevents additional windows from launching when you are surfing a Web site. Web sites and Adware often have pop-ups appear to promote products. With a pop-up blocker enabled, though, you are notified by a yellow bar at the top of the browser indicating when a pop-up is blocked. Click the yellow bar to allow the pop-up.

5. Firewalls

A firewall helps to keep your computer more secure. It restricts information that comes to your computer from other computers, giving you more control over the data on your computer and providing a line of defense against people or programs (including viruses and worms) that try to connect to your computer without invitation. You can think of a firewall as a barrier that checks information (often called traffic) coming from the Internet or a network and then either turns it away or allows it to pass through to your computer, depending on your firewall settings.



6. Strong Passwords

It is really hard to talk about authentication without talking about ensuring that users create strong passwords. A strong password is a password that is very difficult for hackers to guess or crack because it contains a mix of uppercase and lowercase characters, contains a mix of numbers and letters, and is a minimum of eight characters long.

7. User Accounts

To secure the Windows OS from unauthorized access, you can create a user account for each person who is allowed to use the system. Anyone without a user account will be unable to log on to the system and, as a result, will not be able to use the computer. The other benefit of creating user accounts is that even if a person has a user account and logs onto the system, he might not be able to access a file because you have not given permission to that user to access the file.

- **Administrator:** The administrator account is the built-in account in Windows that has full access to the system and can manage all aspects of the computer. During the installation of Windows, you were asked what you wanted to set as the password for the administrator account; you use that password to log on with the username of administrator. When you do log on as administrator, you can change any settings on the system. A normal user account cannot change major settings on the system such as the time, installing software, or any changes that affect the system. To make these types of changes, you need to log on as administrator to make changes.
- **Guest:** Users can use the guest account if they don't have an actual user account. When they try to access the system, they are authenticated as guest. The guest user inherits any permission the guest account has on the system. There is one hook to this scenario, though. By default, the guest account is disabled, meaning that it is not available for use. Because of the security concerns of not requiring someone to log on, Microsoft has disabled the account. A disabled account appears with a red X on it and cannot be used.

8. Data Encryption

Encrypting data converts information to an unreadable format so that if people gain access to the data, they cannot understand it. In the cryptography world, encryption is described as changing plain text to cipher text. As you can likely feel, decryption converts cipher text to plain text. There are a number of ways to encrypt data on the hard drive:

- **EFS:** The Encrypting File System (EFS) is a feature of NTFS and can be enabled through the file properties. After the file is encrypted, it can be read only by authorized persons.
- **Bit Locker:** Instead of encrypting data at the file level with EFS, you can have Windows encrypt the entire partition or volume, which protects all data on the partition, including the Windows OS, the Registry, and the data. With Bit Locker, data is encrypted by using keys stored in a TPM chip or a USB drive, depending upon how Bit Locker has been configured.
- **Third-party software:** You can also use third-party software to encrypt data. For example, you can use the Hide Folder to encrypt all your data.

9. Data Wiping

Companies concerned with corporate security and data privacy will likely opt to destroy the drive instead of recycling because of the risk of having private data lifted off the drive. Instead of destroying the drives with a traditional shredded, some companies use a shredder application. These applications typically overwrite the drive a number of times because hackers can retrieve the data from disk even after it has been overwritten a few times. When purchasing shredding software, be sure to investigate how many overwrite operations the software performs, use software that overwrites at least seven times. I recommend using Software Solution 360.

10. Backing up data

A big part of securing the data environment is not only setting the permissions but also ensuring that you create a good backup and restore strategy. Identify which files are critical to the operation of the business and should be backed up. You also want to be familiar with all types of

information used by your company. For example, you might depend on e-mail, so make sure that you back up your e-mail server along with any files in shared folders. If your company stores important data in databases make sure that you back up those databases as well.

As a last point with backup strategy best practices, you want to test restorations frequently to ensure that you can recover information from backup without any problem. You do not want to find out that the backups are bad when management is hanging over your shoulder waiting for the company network to come back online! Be sure to perform regular test restorations.

11. RAID Solutions

To help secure your data, not only do you want to have good backups, but you also want to ensure that you are implementing some form of a RAID solution. RAID (Redundant Array of Inexpensive Disks), so in this section I review the different types of RAID volumes supported in Windows servers and ensure that you understand that RAID solutions are a way of helping secure data.

RAID is a way of storing duplicated data on multiple disks; if one disk goes down, the data is still available to the users because other disks in the RAID array have a copy of the data. The benefit of using RAID instead of backups is that with the RAID solution, the user never knows that a drive has failed because the other drive is supplying all the data. Note: You still need the backups, though, in case both drives fail, and some disaster happens, like a flood or fire, destroying the system and all of its drives. A number of different types of RAID solutions are available. The ones provided by the Windows Server OS are as follows:

12. Securing Wireless

As a last note, I just want to add a few tips here to help secure your wireless environment. You can configure most of these settings on the wireless router by navigating to the administration site of the router, which involves starting a Web browser and entering either 192.168.0.1 or 192.168.1.1. If you have hit the Web administration pages of the wireless router, you will be asked to log on. Most routers have a default username of admin with no password that you will use to logon.

After you are logged onto the router, locate the following options in the administration pages:

- Router password: After you catch up your wireless router, be sure to connect to the router and change the admin password. Most wireless routers ship with no password, so be sure to protect your router by assigning one.
- Setting the SSID: The Service Set Identifier (SSID) is a name assigned to your wireless network. You should change the name of the SSID, but do not use your company name. When hackers are “war driving,” they pick up on a signal from a wireless network.
- Disabling SSID broadcasting: After you set the SSID, you also want to disable SSID broadcasting. The wireless router broadcasts the SSID so that anyone who gets close will know the wireless network is there. If you disable broadcasting, then to connect to the wireless network, a person has to know and input the SSID manually into his network client.
- MAC address filtering: If you check the administration pages on your wireless router, there is a place for you to enable MAC address filtering. This feature allows you to control which systems can connect to the wireless network by the MAC address of their network card. After MAC address filtering is enabled, only the MAC addresses listed can connect to the network.
- Enable Encryption (WEP/WPA/WPA2): Be sure to enable some form of encryption for your wireless network. You can use a number of protocols to encrypt traffic on your wireless network: WEP, WPA, or WPA2 depending upon what is supported by your wireless router.

Ch. 10 - Troubleshooting, Software Solution 360 & Windows Live

Computer components used to be very expensive. In today's market, though, most components have been turned into construct and can be purchased very cheaply. Because so many elements are so cheap, replacing components is now more common than repairing them. Because of the reduced cost, you can easily have a small supply of spare components and test components by swapping in new and reliable components.

A good troubleshooting store contains many weapons, both hardware and software. After all, not every computer problem is related to the hardware. And even when it is, software tools can sometimes help with the diagnosis. If you are doing field support, create a troubleshooting kit in a handy carrying case with all the tools you use most often.

I show you preventive maintenance routines for your system's devices. Still, no matter how much preventive maintenance you perform, something will eventually go wrong. This chapter continues with the topic of troubleshooting devices – after those something goes wrong. You will be required to repair components from many areas of the computer system. This chapter covers the hardware and software tools of the trade that will help you complete troubleshooting tasks quickly. You will also analysis the major components found in computer systems and address any troubleshooting steps related to those components.

Maintenance Tools

Your cache of protective maintenance tools should include software and hardware devices. A balanced approach to maintenance includes a good number from each category. For you to effectively perform preventive maintenance on your computer equipment, you need the correct tools with you. These tools include the following:

- Oracas Software Solution 360 (2011)
- Oracas Windows XP Express Edition (Windows Express Disc)
- Oracas Windows XP Power Ghost + Windows Live
- Oracas Driver Solution 2008
- Oracas Driver Solution 2009

-OR-

- Automatic update tools for Antivirus, Antispam, Windows, and so on
- OS-level tools, such as defrag.exe, chkdsk.exe, Task Scheduler, and ntbackup.exe
- Recovery or Rescue Boot CD, which you can use to boot up the computer and repair a damaged OS, or rescue data from a no booting hard drive many companies provide a disc with prepackaged tools, I recommend using a tool like Oracas Software Solution 2010 / 360.

Boot / Rescue Disk

To deal with many hard drive issues, you want a boot disk at your disposal. Just booting your system with a Windows boot disk lets you determine whether you can access your hard drive. But to really be able to accomplish a troubleshooting task, or to recover a system, you need a little more power – which you can find in many third-party boot disks and bootable CDs. Most of these solutions include a variety of testing and troubleshooting tools:

Software Diagnostic Tools

Diagnostic tools are available with which you can test several major components in your computer, including drives, processors, memory, serial and parallel ports, keyboards and mice, and network adapters. These testing tools typically verify integrity of components or stress components by performing multiple random or sequential reads and writes on the system.

Troubleshooting with BIOS and Hard Drive Self-Test

In addition to other software solutions, many BIOS routines include built-in testing software. These routines usually can test disks, RAM, processors, and other system components. Like the diagnostic software, these tests will usually perform random or sequential reads and writes to verify the integrity of the components that are being tested.

Post Errors

Each BIOS manufacturer has its own diagnostic codes that identify specific errors. You need to consult documentation for the specific beep codes for your BIOS. Many motherboard manufacturers use codes similar to the original IBM POST codes. If you get only one beep, all is well. In some cases, these beeps are also attended by a diagnostic code, which you also have to look up in the BIOS documentation.

| Beep Code | Description |
|--------------------------|-------------------------------------------------|
| 1 Short Beep | Normal POST; System is okay |
| 2 Short Beeps | POST Error; Error code shown onscreen |
| No Beep | Power supply or system board problem |
| Continuous Beep | Power supply, system board, or keyboard problem |
| Repeating Short Beeps | Power supply or system board problem |
| 1 Long and 1 Short Beep | System board problem |
| 1 Long and 2 Short Beeps | Display adapter problem (MDA, CGA) |

Troubleshooting with Windows System Restore

Another tool that might be helpful when Windows XP won't boot is System Restore. System Restore runs in the background as a service and continually monitors system-critical components for changes. When it detects an impending change, System Restore immediately makes backup copies, called restore points, of these critical components before the change occurs. In addition, System Restore is configured by default to create restore points every 24 hours.

To use System Restore, first restart the computer. When you hear the single beep, press **F8** to display the Windows Advanced Options menu. Now, select the Safe Mode. Once Windows XP boots into Safe mode, click the Start button, access the All Programs-Accessories-System Tools-select System Restore. Because you're running in Safe mode, the only option on the opening screen of the System Restore wizard is Restore My Computer to an Earlier Time, and it's selected by default, so just click Next. Then, follow along with the wizard to select a restore point and begin the restoration procedure.

Troubleshooting with Recovery Console

When a Windows XP boot problem is severe, you'll need to use a more extreme approach. The Windows XP CD is bootable and will provide you with access to a tool called Recovery Console. To boot from the Windows XP CD, when you see the Welcome to Setup screen, press R to start the Recovery Console.

Fix a corrupt Boot.ini

As the Windows XP operating system begins to load, the NTLDR program refers to the Boot.ini file to determine where the operating system files reside and which options to enable as the operating system continues to load. So if there's a problem rooted in the Boot.ini file, it can render Windows XP incapable of booting correctly.

Bootcfg /parameter

- /Add Scans the disk for all Windows installations and allows you to add any new ones to the Boot.ini
- /Scan Scans the disk for all Windows installations
- /List Lists each entry in the Boot.ini file
- /Default Sets the default operating system as the main boot entry
- /Rebuild Completely re-creates the Boot.ini file. The user must confirm each step

Fix a corrupt MBR

The master boot record occupies the first sector on the hard disk and is responsible for initiating the Windows boot procedure. The master boot record contains the partition table for the disk as well as a small program called the master boot code, which is responsible for locating the active, or bootable, partition, in the partition table. To use the Fixmbr tool, from the Recovery Console command prompt, type

Fixmbr [device_name]

Where [device_name] is the device pathname of the drive to which you want to write a new master boot record. For example, the device pathname format for a standard bootable drive C configuration would look like this:

```
\Device\HardDisk0
```

Oracas Software Solution 360

Software Solution rescue disc can use to boot up the computer and repair a damaged operating system or rescue data from a non-booting hard drive. To deal with many hard drive issues, you want a rescue disc at your disposal. Just booting your system with Software Solution lets you determine whether you can access your hard drive. But to really be able to accomplish a troubleshooting task, or to recover a system, you need a little more power which you can find in many third-party boot disks and bootable disc.

Software Solution 360 comes with both USB 2.0 and Firewire interface all built in DOS drivers. You can now turn any IDE, SATA hard drive or an external storage device that can be attached to any computers via either USB 2.0 or Firewire connection. DOS NTFS support provides access to NTFS drives. It supports long filenames as well as compressed and fragmented files. It allows you to preview the files on NTFS and copy them from NTFS to FAT volumes or network drives.

Data Recovery Tools

Data recovery is the process of salvaging data from damaged, failed, corrupted, or inaccessible secondary storage media when it cannot be accessed normally. Often the data are being salvaged from storage media such as hard disk drives, storage tapes, CDs, DVDs, RAID, and other electronics.

I. Active Partition Recovery

Active Partition Recovery is a DOS software tool that helps to recover (undelete) deleted partition and logical disks on PC hard drives. It can back up the MBR (Master Boot Record), partition table, and boot sectors, and restore MBR from backup if the partition structure was damaged by a virus or inadvertently deleted.

II. TestDisk 6.1 Data Recovery Utility

A tool to check and undelete partitions Test Disk was primarily designed to help recover lost partitions and/or make non-booting disks bootable again when these symptoms are caused by faulty software, certain types of viruses or human error (such as accidentally erasing your Partition Table).

III. PhotoRec 6.1 Data Recovery Utility

By data recovery we understand that it is a process of saving data from inaccessible primary media when it cannot be accessed normally. You can recover data from various storage media devices (hard disk drives, CDs, DVDs, RAID, etc.). Usually the data is lost due to physical damage or because of some logical damage to the file system.

There are three ways you can lose data: by deleting, formatting or overwriting. Deleting and formatting are the only situations when you can recover the files. Overwriting however does not give you that chance. You may have heard rumors that even overwritten data can be recovered, but there is no solid evidence on that. Actually, no data recovery company today claims that it can recover overwritten information.

Data Erasing Tools

Data Erasing / Data wiping / Secure Erase procedure is performed when it is for some reason necessary to irreversibly delete some data. This procedure is typically applied to "sensitive" (i.e. top secret) data only. When you erase the file by using normal means, the corresponding references are deleted and the space formerly occupied by the file is marked as being free. However, the actual file data remains intact on the disk until the space is claimed by some other

file (at which point the original data is overwritten). We consider data overwritten at least once beyond any recovery. While it was possible to recover previous layers of data from older generation media (like magnetic tapes), we consider this is impossible with the modern hard drives. Rumor has it the other way, referring to some obscure "government agencies" being able to recover previous layers of data. We believe such references are a hoax. For any kind of electronic memory (i.e. not involving magnetic surfaces, examples being RAM and SSD devices) the recovery of overwritten data is certainly impossible, because no remains of previous state are available by the very design of the storage.

I. Active@ KillDisk

Active@ KillDisk is powerful and compact DOS software that allows you to destroy all data on hard and floppy drives completely, excluding any possibility of future recovery of deleted files and folders. This is security software for unrecoverable data elimination for any computer capable of booting in DOS mode. Active@ KillDisk conforms to US Department of Defense clearing and sanitizing standard DoD 5220.22-M. You can be sure that once you clean up with Active@ KillDisk, sensitive information is purged out forever.

II. Hard Drive Eraser

Hard Drive Eraser is application that permanently erases the data on whole volumes (hard drives). It does so by filling the magnetic surface multiple times with a useless binary data. It is a known fact that it is impossible to permanently destroy data just by formatting hard drive. It doesn't matter if you use Windows formatting or pay for a commercial disk formatting program.

III. Secure Erase

Secure Erase 4.0 is a DOS-based utility that securely erases "sanitizes" all data on ATA hard disk drives in Intel architecture computers (PCs). It offers the option to run the drive internal secure erase command, security erase unit, based on the ATA specification by the T13 technical committee.

IV. CopyWipe

CopyWipe is a DOS based disk utility that allows you to copy an entire hard drive to another as well as securely wipe an entire hard drive. When copying a hard drive the partitions can be scaled to utilize the size of the new hard drive. The wiping feature allows secure erasure of an entire hard drive.

Advanced Tools

I. GAZE Picture Viewer

GAZE, or Graphics Analyzer, Zoomer and Enhancer, is a viewer for graphics files in JPEG, BMP, Targa, LBM, PCX or PNG format. As its name suggests, GAZE has several functions beyond simply loading and displaying a picture. GAZE allows the user to pan and zoom the picture in a fluid manner using the mouse, where most viewers slowly zoom in steps, if at all. Moreover, GAZE has a few more tricks up its sleeve; when you stop zooming or panning, GAZE takes the opportunity to use its interpolation facilities to improve the quality of your zoomed picture. Moreover, GAZE automatically optimizes the palette used in 8 bit modes after analyzing the relative frequency of different colors.

II. PictView

PictView is a mouse-driven viewer and converter of images. It runs on all EGA, VGA, SuperVGA and Extended-VGA video adapters. PictView is able to read images stored in approximately 40

graphics file formats and convert them into another format. All functions are extremely fast, up to 10 times faster than other programs.

III. QuickView

QuickView Protected Mode V2.58 DOS based Multimedia Viewer with support for the video formats MPEG, AVI (incl. DivX), MOV, DL, FLI/FLC and animated GIF, the sound formats WAV, VOC, Audio MPEG (incl. MP3), Ogg Vorbis and the picture formats JPG, BMP, GIF, PCX, TGA and more. Very fast picture display. Also supports VideoCD and CD-i playback.

IV. BINGBURN

BINGBURN is a simple and easy to use tool that allows you to burn a set of image files created by TeraByte Unlimited imaging products to DVD, CD or BD from Windows.

V. Active@ Password Changer

Active@ Password Changer is designed for resetting local administrator and user passwords on Windows XP / VISTA / 2008 / 2003 / 2000 & Windows 7 systems in case an Administrator's password is forgotten or lost. You do not need to re-install and re-configure the operating system. With Active@ Password Changer you can log in as a particular user with a blank password.

Boot Managers

I. EditBINI

EditBINI DOS based utility to edit the \BOOT.INI file on an NTFS partition. This program will run under DOS or Win9x/ME. It will not run correctly under Windows NT/2K/XP.

II. XOSL

Extended Operating System Loader (XOSL) is the world's only full-featured free boot manager with a real, easy-to-use and full-blown graphical user interface. Extended Operating System Loader allows you to boot operating systems from single or from multiple disk partitions. For every bootable system, you can configure which other partitions should be hidden. For every bootable system, as well as for the configuration screens, you can also enable password protection. XOSL can be installed on a running DOS, Win9x or WinME system or on a small dedicated partition. It also includes a free partition manager.

III. MBR Works

MBRWork is a utility to perform some common and uncommon tasks to the MBR/EMBR sectors of a hard drive. It should only be used by power users who understand how computers work.

IV. MBR Tool

MBRtool lets you back up, restore, and manipulate just about anything in the hard disk MBR and track0. You can edit partition tables and change attributes for partitions. You can also re-create a MBR from scratch. All actions can also be performed on MBR backups, making this tool useful for recovery purposes.

File Management Tools

A file manager or file browser is a computer program that provides a user interface to work with file systems. The most common operations performed on files or groups of files are: create, open, edit, view, print, play, rename, move, copy, delete, search/find, and modify attributes, properties and permissions. Files are typically displayed in a hierarchy. Some file managers contain features inspired by web browsers, including forward and back navigational buttons.

I. DOS Navigation

Necromancer's Dos Navigator is a "Norton Commander" clone. Necromancer's Dos Navigator uses a well known text-mode interface, is highly customizable, and has a lot of features.

II. File Maven

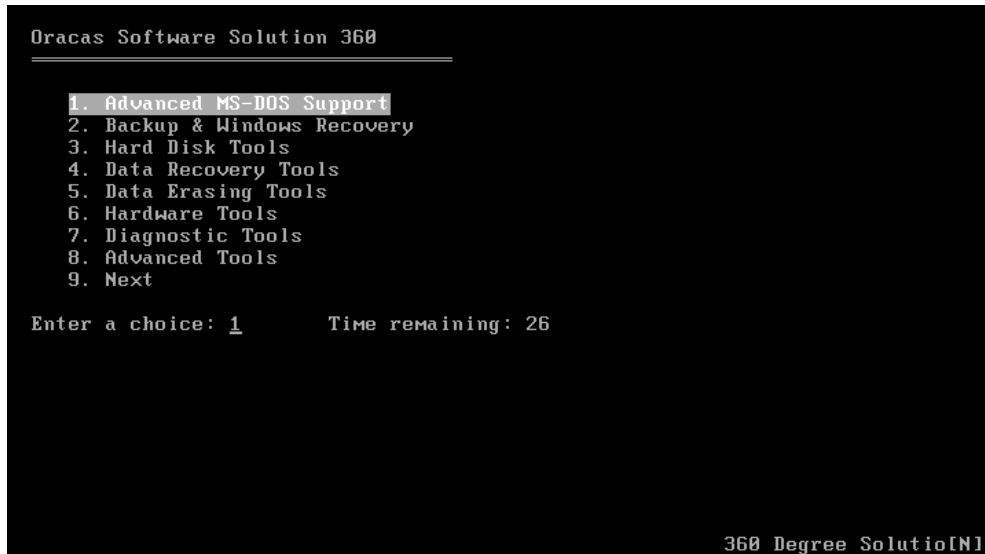
File Maven is a dual directory file manager that makes copying and moving files much easier than with Windows Explorer. You can jump to any subdirectory with a few keystrokes or find files with the advanced search feature. File Maven Pro also includes a universal file viewer, a text editor, a file splitter, a zip file handler, and much more.

Oracas Software Solution 360 (Menu Map)

- Hard Disk Boot
- Solution Boot
 - Advanced MS-DOS Support
 - MS-DOS with CD/DVD-ROM support
 - MS-DOS with NTFS partition support
 - MS-DOS without CD/DVD-ROM support
 - Backup & Windows Recovery
 - Make Windows Recovery Image
 - Restore Windows Recovery Image
 - Start Norton Ghost 2008 Manually
 - Hard Disk Tools
 - Partition Tools
 - Norton Partition Magic Pro Server 8.0
 - Paragon Partition Manager
 - Ontrack Disk Manager 2000
 - Ranish Partition Manager
 - Extended Fdisk
 - Super Fdisk
 - Smart Fdisk
 - Free Fdisk
 - Fdisk Maintenance Utility
 - Maintenance Tools
 - Norton Disk Doctor
 - Norton Disk Editor
 - PTS Disk Editor
 - Acronis Disk Director Suite
 - SpinRite 6.0
 - ATA Password Tool 1.1
 - SmartUDM - HDD S.M.A.R.T Viewer 2.0
 - OEM Tools
 - Seagate
 - Seagate Sea Tools 1.0
 - Seagate Sea Tools 2.0
 - DiscWizard Starter Edition
 - Ultra ATA/100 Utility 3.0
 - Western Digital
 - Data Lifeguard Diagnostics 5.0
 - Data Lifeguard Ultra ATA Management
 - Data Lifeguard Tools
 - Samsung
 - ESTOOL 3.0
 - HUTIL 2.1
 - Disk Manager
 - Maxtor
 - Maxtor Low Level Formatter 1.1
 - PowerMax 4.2
 - MaxBlast 4

- Fujitsu
 - Fujitsu Diagnostic Tools 7.0
 - FJ-IDE Initializer Utility
- Hitachi
 - Hitachi Drive Fitness Test 4.1
 - Hitachi Feature Tool 2.1
- Data Recovery Tools
 - Active Partition Recovery 3.0
 - TestDisk 6.1 Data Recovery Utility
 - PhotoRec 6.1 Data Recovery Utility
- Data Erasing Tools
 - Active@ KillDisk 4.1
 - Hard Drive Eraser 1.0
 - Secure Erase 4.0
 - Copy Wipe 1.1
- Hardware Tools
 - BIOS Tools
 - BIOS 3.2 - Security & Maintains Toolkit
 - UniFlash 1.4
 - CMOS Password Cleaner
 - CMOS Password Recovery Tool
 - Wipe CMOS
 - Processor Tools
 - Check CPU
 - Intel Processor Frequency ID Utility 7.1
 - Intel Processor Identification Utility 4.2
 - Disk Detection Tools
 - HDAT2 4.7
 - Hard Disk Drive Testing Utility
 - CD-ROM INF 1.2
- Diagnostic Tools
 - PC Doctor 3.0
 - PC Check 6.0
 - PC Config 9.3
 - System Analyser 5
 - CPU, Video, Disk Test & Detection
 - Advanced Sysinfo Tool and Repairing Assistant 5.4
 - Navratil Software System Information
- Advanced Tools
 - GAZE Picture Viewer 1.2
 - PictView Picture Viewer 1.9
 - QuickView Pro Video Player 2.5
 - BingBurn Image Burning Tool
 - Active@ Password Changer
- Next
 - Boot Managers
 - EditBini
 - XOSL 1.1
 - MBR Work

- MBR Tool
- File Management Tools
 - DOS Navigation
 - File Maven



Oracas Software Solution 360 Image