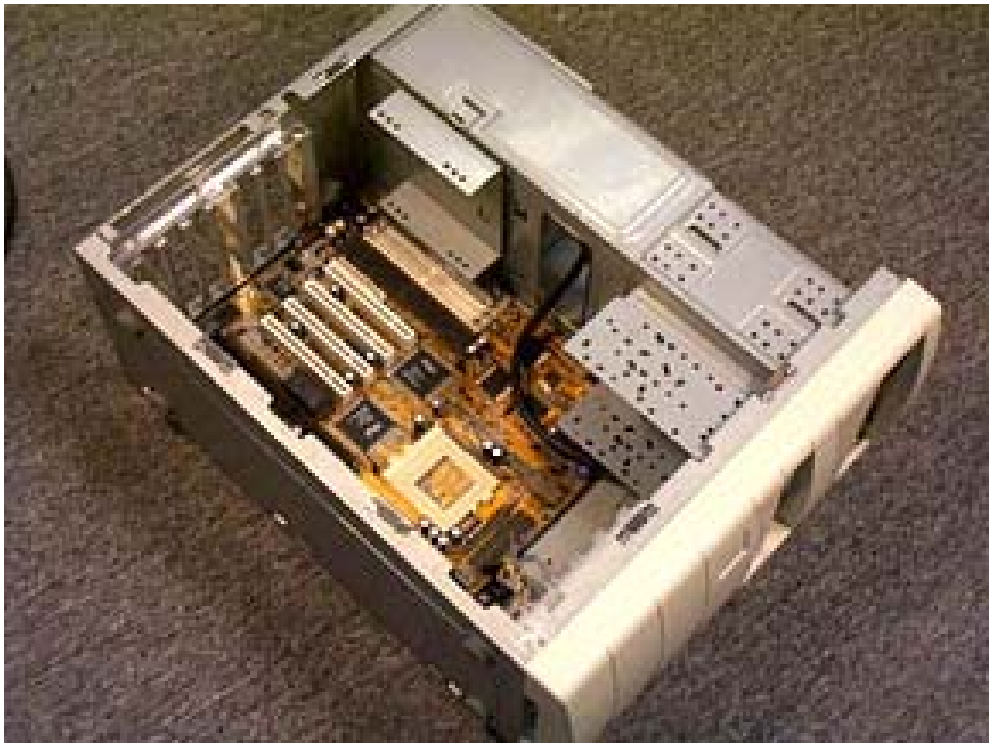
How Does the Computer Work?

Exploring what is inside the computer case

Family Learning Day
February 21, 2004

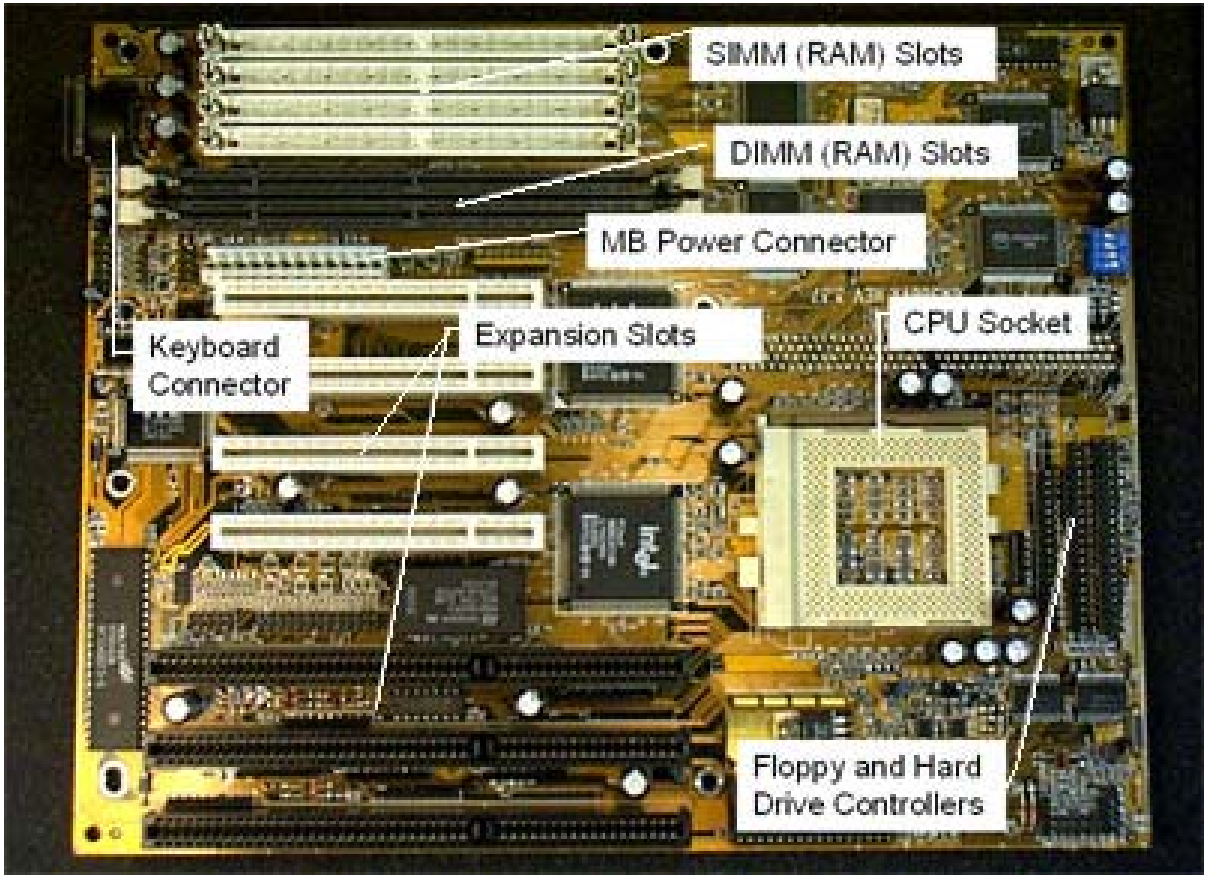
Computer Case

- The part of the PC that you actually see is the case
- It is officially called the "system unit," but most techs call it the case.



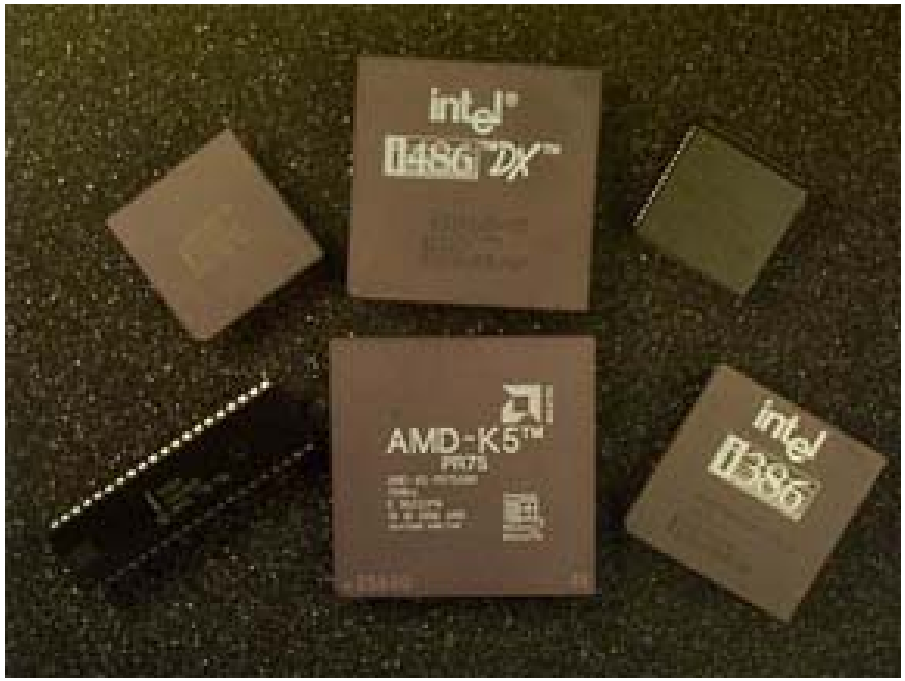
Motherboard

- Everything is connected to the motherboard
- A motherboard is a thin, flat piece of circuit board, usually of green or gold color, usually slightly larger than a piece of paper.



CPU

- The CPU (Central Processing Unit, also called the microprocessor) is where all the calculations take place in the PC.
- CPUs will be either PGA (Pin Grid Array) or SEC (Single Edge Cartridge).

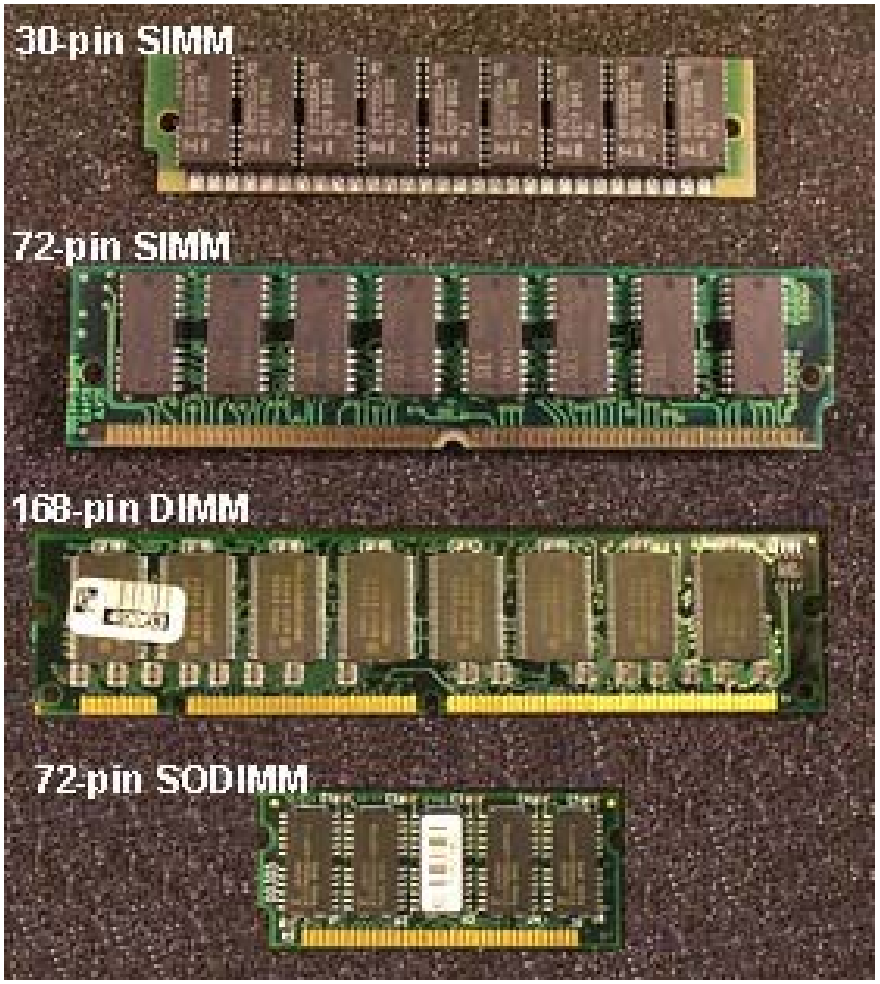


CPU

- CPUs have a "make" and a "model," just like an automobile. When talking about a particular car, we say terms such as "Ford Taurus." When we talk about a CPU, we say terms like "Intel 486" or "AMD K6."
- “Makes" are AMD, Cyrix and Intel.
- Models are 486, Pentium, Pentium Pro, Pentium II, Pentium III, K6, K6-2, and Athlon.
- In the early years of CPUs, manufacturers would sometime make the exact same model. You could get an AMD 486 or an Intel 486. This is no longer true, although some models are very similar, such as the Intel Pentium and the AMD K6.

RAM (Random Access Memory)

- RAM (Random Access Memory) is where the CPU stores programs and data that it is currently using.
- RAM is measured in units called "bytes“ and "megabytes."
- An average PC will usually have anywhere from 16 megabytes up to 512 megabytes of RAM.

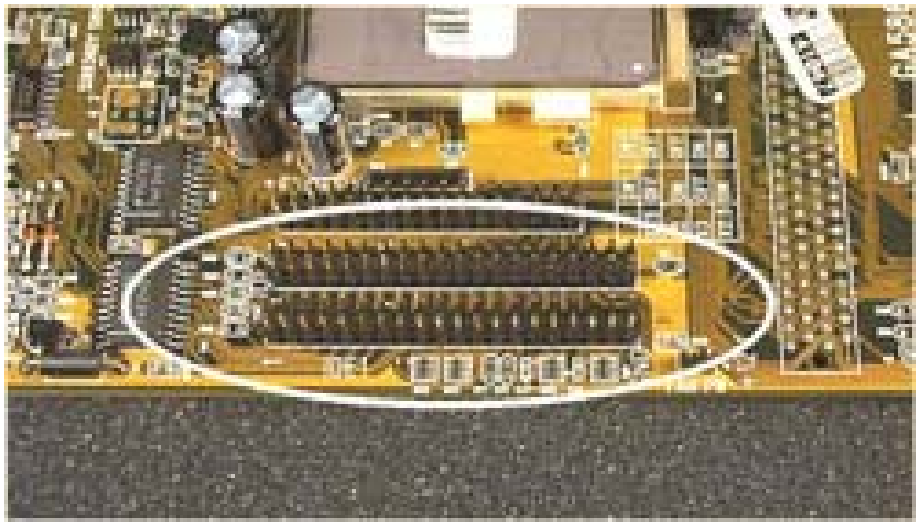


Hard Drive

- Hard drives store programs and data that are not currently being used by the CPU.
- Hard drive capacity is measured in megabytes and gigabytes.
- An average PC will have at least one hard drive.
- The capacity of a single hard drive can vary from as low as 10 megabytes (very old systems) up to 20, 40, or more gigabytes.
- There are two common types of hard drives: IDE and SCSI.

IDE Controller

- Any PC might have IDE, SCSI or both installed.
- IDE drives use a roughly 1.5" wide, 40-pin ribbon cable
- SCSI drives will use a roughly 2" wide, 50-pin cable
- IDE supports up to two hard drives per controller.
- Each ribbon cable has two connectors for hard drives.
- With two controllers, each controlling two drives, a PC can support up to four IDE drives.



IDE Controller

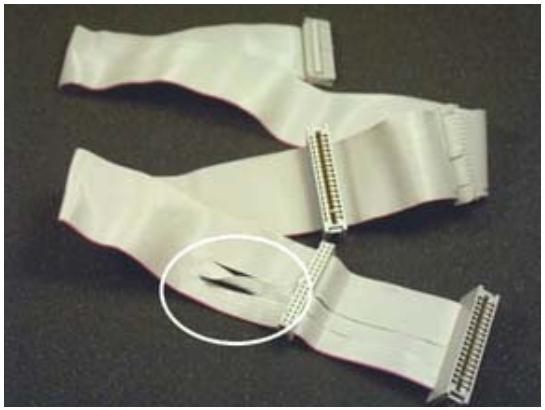
Hard drives connected with one cable to one IDE connection.

CD-ROM Drive

- CD-ROM drives enable the system to access CD-ROM disks. CD-ROM drives are quite large, usually the single largest component inside the PC.
- They are connected with an IDE cable to an IDE controller.

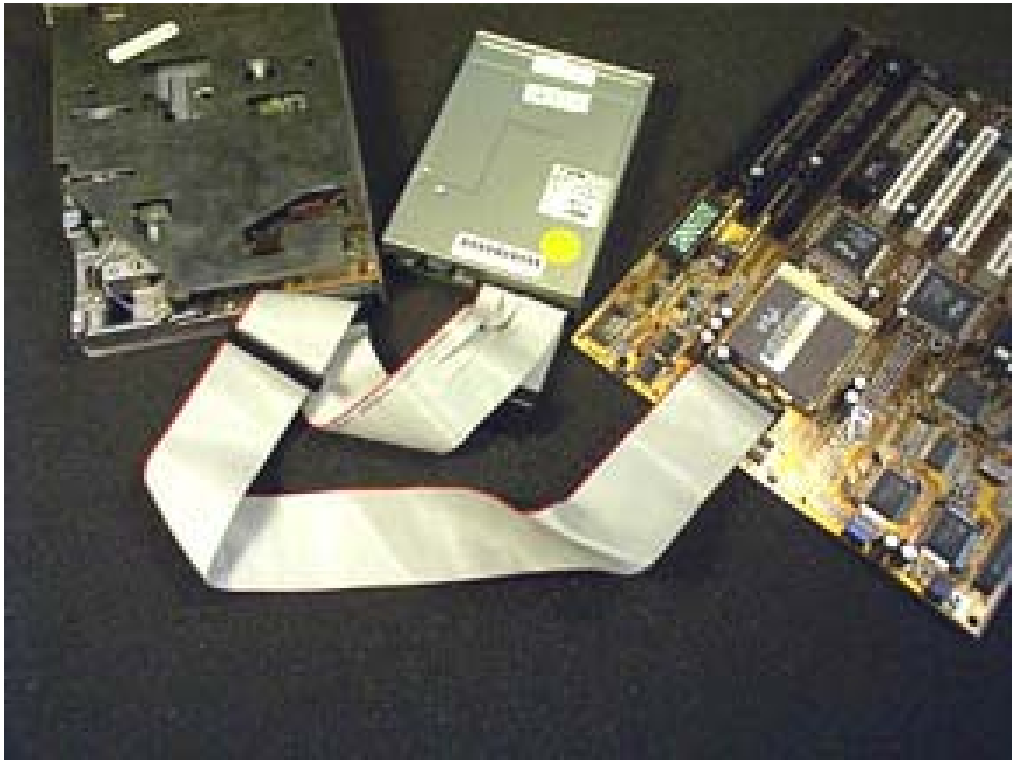
Floppy Drive

- The floppy drive enables you to access floppy diskettes. There are two types of floppy drives, a 3.5" and a 5.25." The 5.25" drive is completely obsolete but is still encountered on older PCs.
- Floppy ribbon cables are the narrowest ribbon cable, only slightly more than 1" wide.
- There is a twist in the cable, usually close to where the floppy cable is connected to the floppy drive.



Floppy Drive

- A PC can support up to two floppy drives.
- If a PC has two floppy drives, they will be connected to the same ribbon cable.

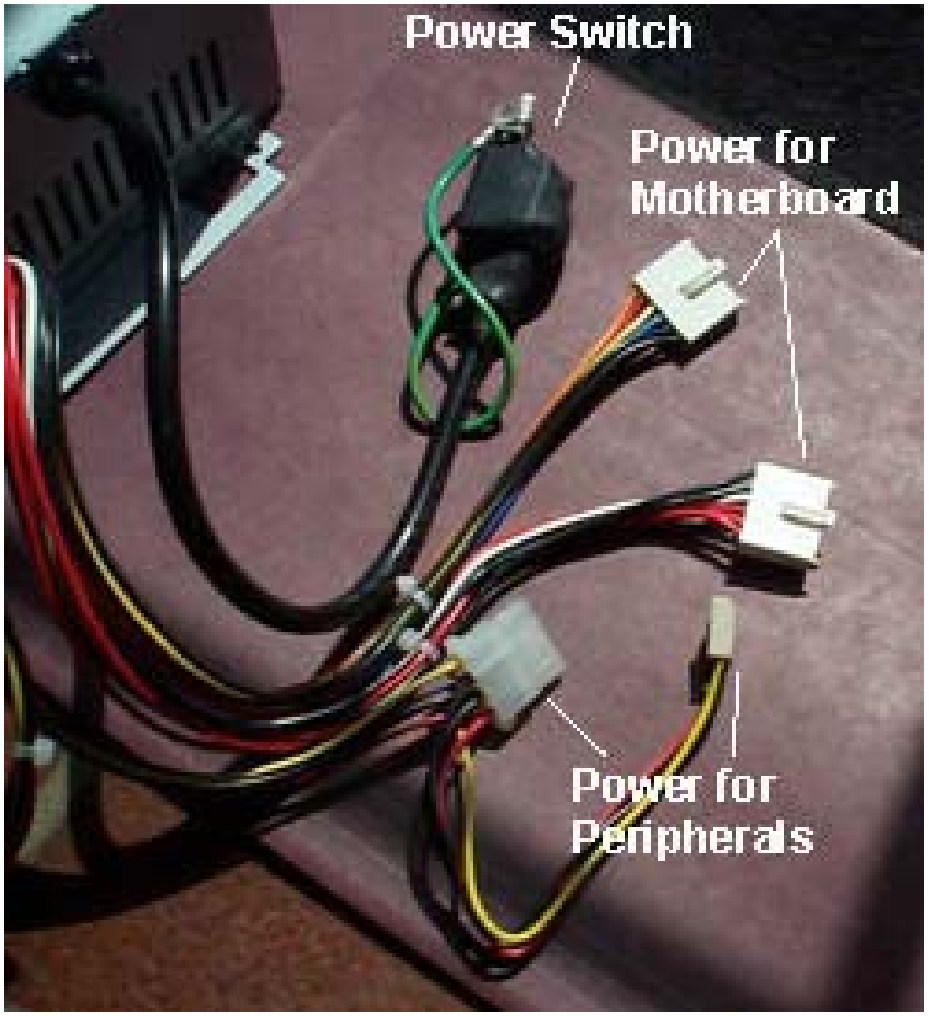


Power Supply

- The Power Supply provides the necessary electrical power to make the PC operate.
- It takes standard 110 volt AC power and converts it into 12, 5, and sometimes 3.3 volt DC power.
- The vast majority of power supplies are about the size of a shoebox cut in half and are usually gray or metal colored.

Power Supply Cable

- Every drive needs to be connected to a power connector.
- There are several power connectors on one power supply cable.



Connectors

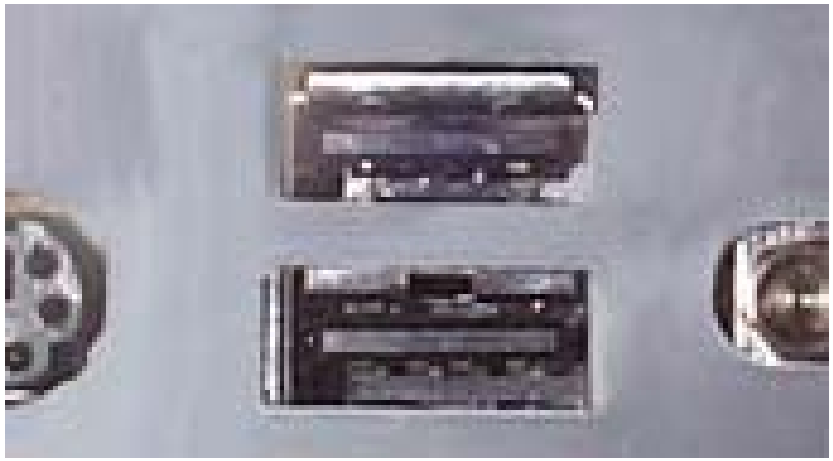
- There are many types of connectors (often called "ports") that different devices use.
- Although there are close to 50 different connectors used with PCs, almost all connectors break down into these types: "DB," "DIN," "Centronics," "RJ, "USB, " and "Audio."

Keyboard and Mouse Connection

- All PCs have a keyboard port directly connected to the motherboard.
- Two types of keyboard connectors:
  - DIN type connector popularly known as the "AT-style"
  - PS/2 style“ or mini-DIN
- PS/2 style mini-DIN is for both the keyboard and mouse
- Each mini-DIN socket is clearly marked as to its correct use

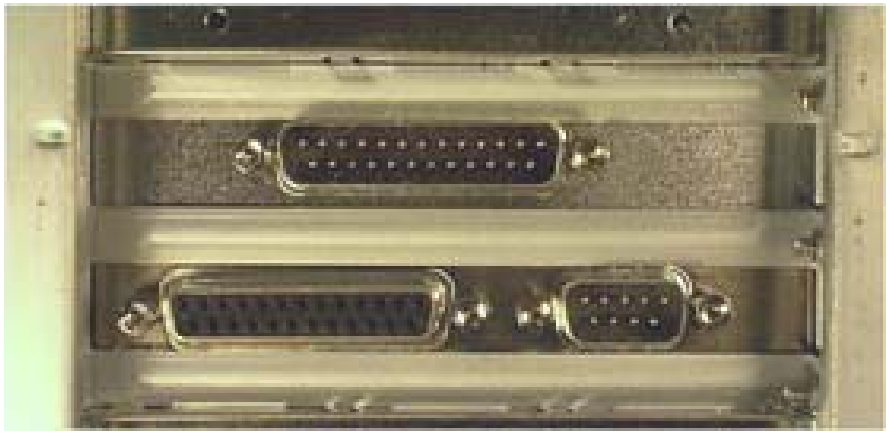
Universal Serial Bus (USB)

- USB ports can handle many more devices
- Keyboards
- Mouse
- Digital cameras
- Printers
- And many more…



DB Type Connectors

- They have a slight D shape, designed to allow only one proper way to insert the plug into the socket.
- Each DB connector has groups of small pins and sockets (male/female) which insert as a group.
- DB connectors can have from 9 up to 37 pins.
- DB connector with more than 25 pins is now quite rare.
- Sockets can be either male or female.



DIN Connectors

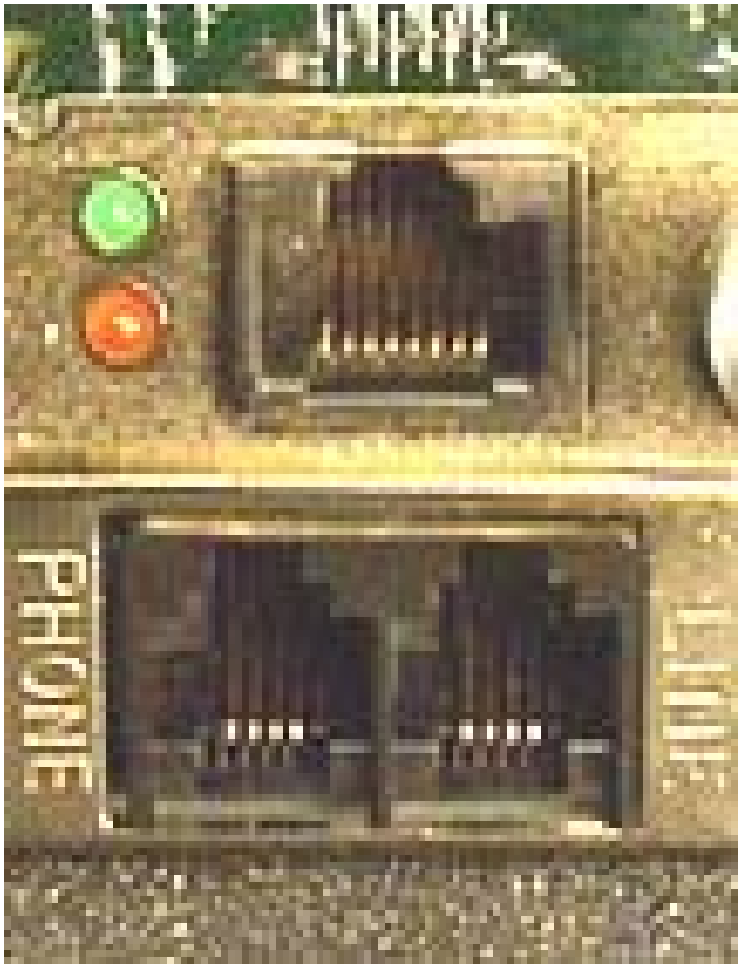
- DIN connectors are a European design that is also common on every PC.
- These connectors are round and come in only two common sizes: DIN and Mini-DIN.
- The sockets are always female.

Centronics Connector

- Centronics connectors use one large central tab, covered with contacts instead of pins although, the word "pins" is still used to describe the number of contacts.
- Centronics connectors are also distinct in that the sockets have wire "wings" that lock the plug to the socket to reduce the chance of accidental removal.
- Sockets are always female.
- Almost every printer in existence, however, has a 36-pin Centronics socket.

RJ Type Plug

- The little plastic plug used to connect your telephone wire to the jack is a classic example of an RJ type plug.
- Two types of RJ jacks used in PCs: the RJ-11 and the RJ-45.
- The phone jack is the RJ-11. It is used almost exclusively for modems.
- RJ-45 is used for one very popular type of network cabling and most network cards have a RJ-45 socket.



Audio Connectors

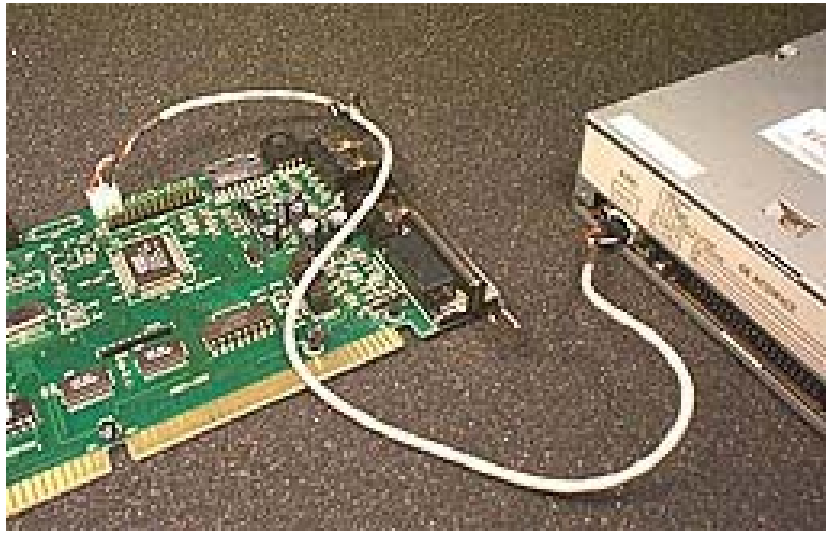
- Audio connectors are perhaps the simplest of all.
- Use to plug into soundcards.

Sound Card Connection

- Soundcards perform two functions; 1) they take digital information and turn it into sound, outputting the sound through speakers. 2) they take sound, inputted through a microphone, and turn it into digital data.
- In order to play and record sounds, a soundcard needs to connect at least to a set of speakers and a microphone.
- Soundcards have four sockets for mini-type audio jacks:
  - Microphone, Speaker, Line In, and Line Out.
- Soundcards will also have a female 15-pin DB socket that enables you to connect electronic musical instruments.

Sound Card

- The Microphone and Speaker connect a microphone and speakers.
- Line In enables a soundcard to record from a stereo, tape recorder, etc.
- Line Out enables the soundcard to output to those same type of devices.
- Most PCs will have a small cable running between the soundcard and the CD-ROM to enable the CD-ROM to play audio CD-ROMs through the soundcard.
- Turning your PC into a stereo system!

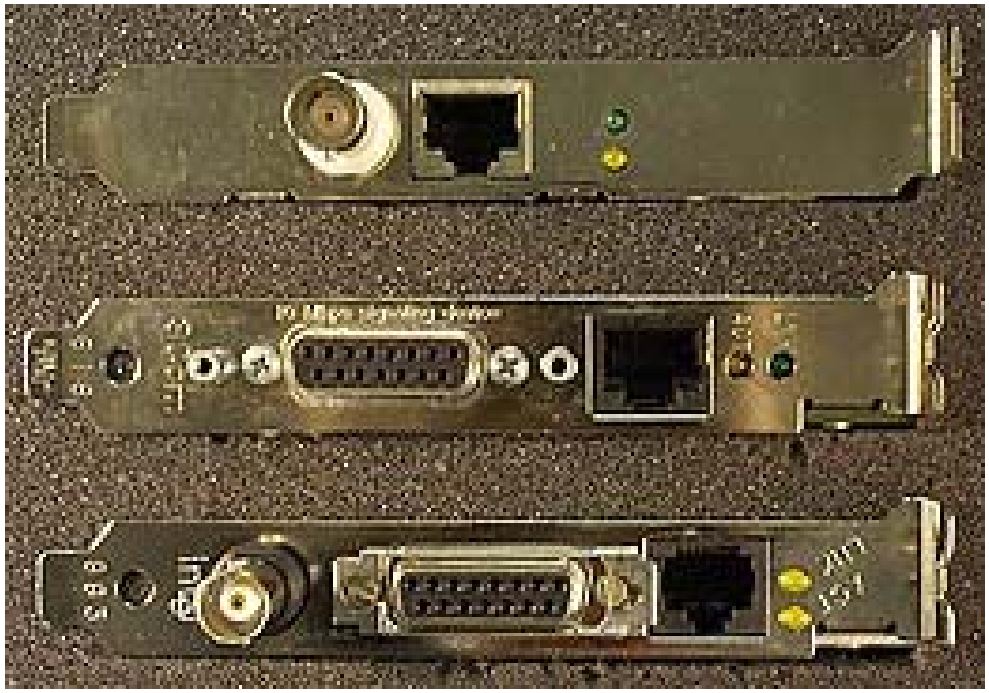


Video Card

- The video card will have a distinct 15-pin female DB connector.
- While most DB connectors will have only two rows of pins, the video card will have three rows.

Network Card

- Networks are connected PCs that share information. The PCs are usually connected by some type of cabling, usually an advanced type of phone cable or coax.
- Network cards (NICs) provide the interface between the network and the PC.
- A NIC will be distinguished by having one of the following types of connectors:
  - RJ-45
  - 15-pin female DB
  - 9-pin female DB.
  - It is very common to see NICs with more than one connector.

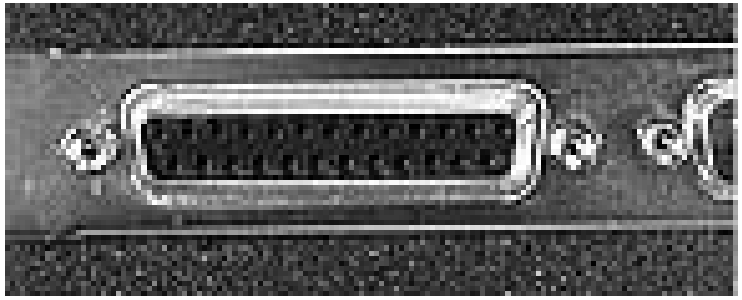


Modem

- A modem works with your telephone line.
- A modem is designed to translate analog telephone signals into digital serial data.
- An external modem sits outside the PC and is plugged into a serial port.
- Modems have RJ-11 sockets.

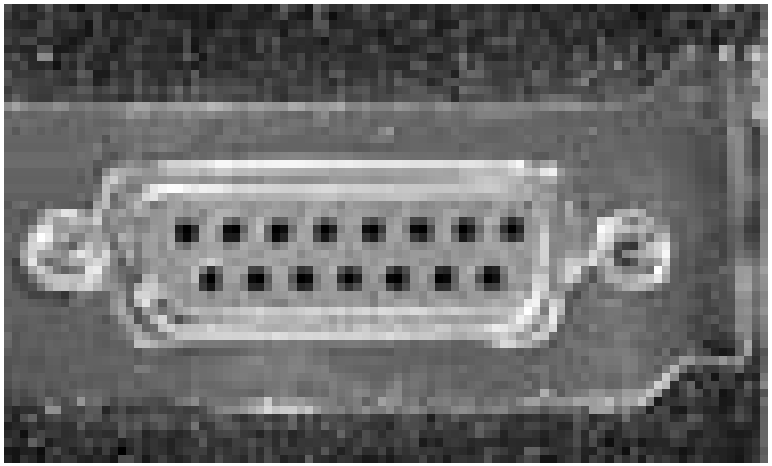
Printer Connection

- Printers use a special connector called a "parallel" port.
- Parallel ports carry data on more than one wire, as opposed to the serial port that only uses one wire.
- Parallel ports have a distinct 25-pin female DB connector.



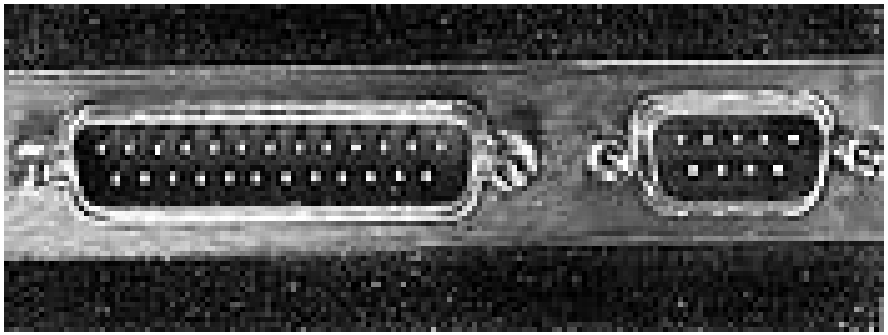
Joystick Connector

- **15-pin female DB joystick connector for PCs**.



Serial Port

- It takes a stream of serial data (data that runs on only one wire) and converts it into a format that is easily understood by the CPU.
- The serial connector was and is either a 25- or a 9-pin male DB connector.
- You can get an adapter that enables you to convert 9 to 25 or 25 to 9.



Exercise: Cleaning a Mouse

On bottom of mouse:

1. Remove the round plate that holds the mouse ball in place. Open by turning the plate.
2. Remove the plate and ball.
3. Pick out “fuzz” and dirt.
4. Clean the ball with soapy water.
5. Dry the ball and replace it and replace cover.

Exercise: Play the Human Computer Game

1. Count off by two's.
2. Pin the picture and name of a "computer component" to your back.
3. Ask your partner about 5-10 questions about what type of "computer component" you are until you guess the name of the component.
4. Be sure to use the computer terms you learned during the presentation.