Input and Output Devices

Hardware that allows us to communicate with the computer

User Interface

The hardware and software that is used to communicate with and control the computer is called the **user interface**.

Input and output devices are the hardware part of the user interface.

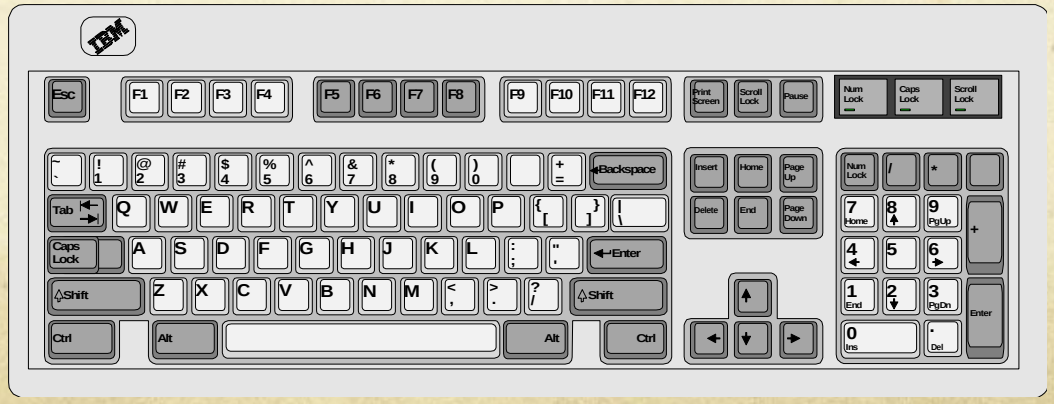
A **user response** is an instruction a user issues by replying to a question displayed by a program.

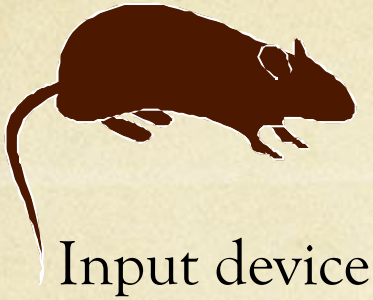
Keyboards

Used to input letters, numbers, punctuation and symbols.

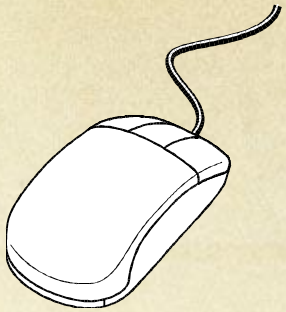
Besides the basic keys, there are the:

- numeric keypad
- function keys
- arrow keys



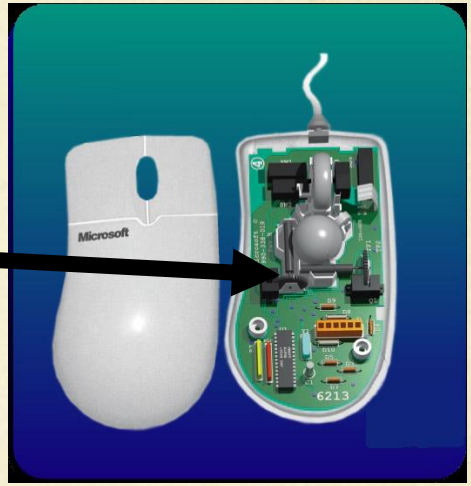


Mouse



Input device that lets you control a pointer on the screen.

- Mechanical
- Optical
- Wireless



MOUSE OPERATIONS

Operation	Mouse Action	Example
Point	Move the mouse across a flat surface until the pointer on the desktop is positioned on the item of choice.	Position the pointer on the screen.
Click	Press and release the primary mouse button, which usually is the left mouse button.	Select or deselect items on the screen or start a program or program feature.
Right-click	Press and release the secondary mouse button, which usually is the right mouse button.	Display a shortcut menu.
Double-click	Quickly press and release the left mouse button twice without moving the mouse.	Start a program or program feature.
Triple-click	Quickly press and release the left mouse button three times without moving the mouse.	Select a paragraph.
Drag	Point to an item, hold down the left mouse button, move the item to the desired location on the screen, and then release the left mouse button.	Move an object from one location to another or draw pictures.
Right-drag	Point to an item, hold down the right mouse button, move the item to the desired location on the screen, and then release the right mouse button.	Display a shortcut menu after moving an object from one location to another.
Rotate wheel	Roll the wheel forward or backward.	Scroll up or down a few lines.
Press wheel button	Press the wheel button while moving the mouse on the desktop.	Scroll continuously.

Other Pointing Devices

- **Trackball:** sort of an upside-down mouse
- **Touch Pad:** found more often on laptops
- **Touch Screen:**often used in museums
- **Stylus and digital pen –** use pressure
- **Light Pens**

Controllers for games and media players

Audio Input

Enter music, speech or sound effects via tape, CD, microphone or MIDI device.

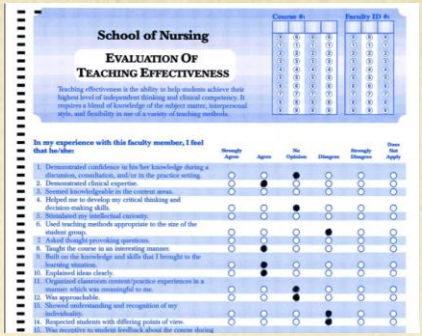
- Microphones allow you to input any sound
- MIDI devices allow you to compose or edit music
- **Voice recognition** software allows the computer to recognize the spoken word

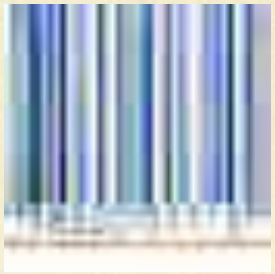
Video Input

Graphics - any kind of pictures, still or moving, photographs or drawings.

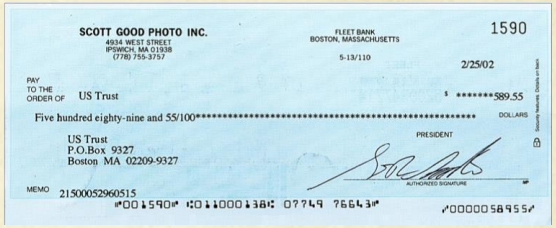
- Digital camera
- Video Capture
- PC cameras
- Video Conferencing

Scanners

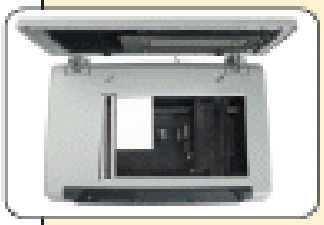
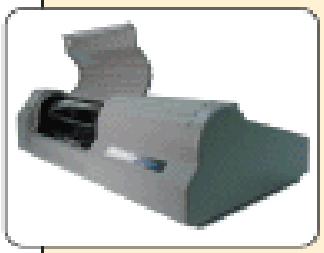




- Optical scanner
- Optical Character Recognition
- Optical mark recognition
- Radio Frequency Identification
- Magnetic Ink Character Recognition
- Magnetic stripe
- Bar code scanner



TYPES OF SCANNERS

Scanner	Method of Scanning and Use	Scannable Items
Flatbed 	• Similar to a copy machine • Scanning mechanism passes under the item to be scanned, which is placed on a glass surface	• Single-sheet documents • Bound material • Photographs • Some models include trays for slides, transparencies, and negatives
Pen or Handheld 	• Move pen over text to be scanned, then transfer data to computer • Ideal for mobile users, students, and researchers • Some connect to a PDA or smart phone	• Any printed text
Sheet-fed 	• Item to be scanned is pulled into a stationary scanning mechanism • Smaller than a flatbed scanner • A model designed specifically for photographs is called a *photo scanner*	• Single-sheet documents • Photographs • Slides (with an adapter) • Negatives
Drum 	• Item to be scanned rotates around stationary scanning mechanism • Very expensive • Used in large businesses	• Single-sheet documents • Photographs • Slides • Negatives

Biometrics

- Fingerprint scanner
- Hand geometry system
- Face recognition
- Voice verification
- Signature verification
- Iris recognition

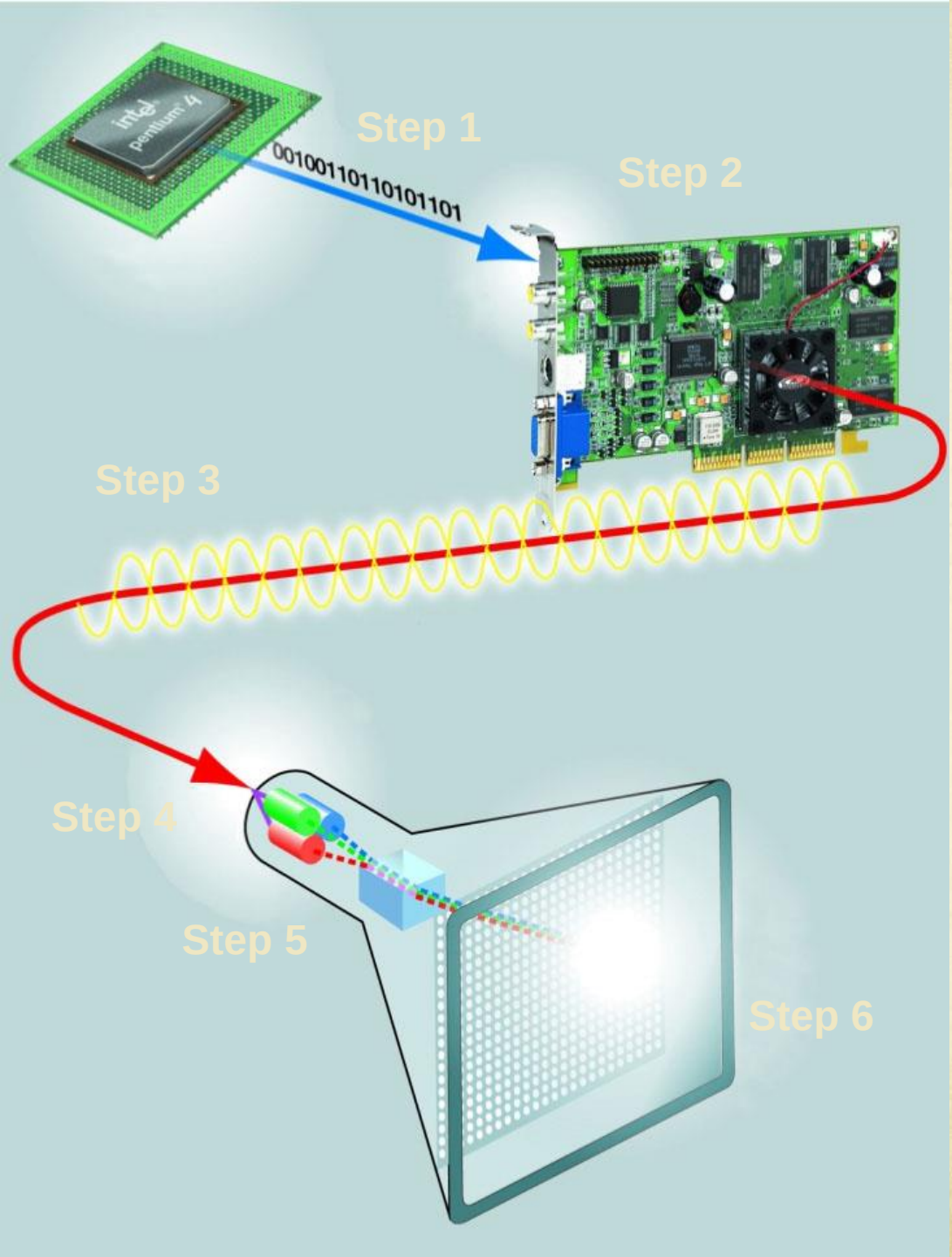
Output Devices

- Different types of output:
  - text
  - graphics
  - audio
  - video

- Different types of output devices:
  - monitors/display devices (soft copy)
  - printers (hard copy)
  - speakers

How a CRT works

- A traditional CRT monitor uses three electron guns in the narrow end (back).
- They "shoot" electrons towards the large flat surface facing the user.
- The inside of the glass surface we look at is coated with tiny phosphorous dots. They are arranged in groups of three colors – **red, green and blue** phosphorescent dots.
- These dots light up, when hit by electrons from the electron gun. Each of the mini dots is hit by one electron beam.
- Together they form one pixel.



1: Processor sends digital data to video card

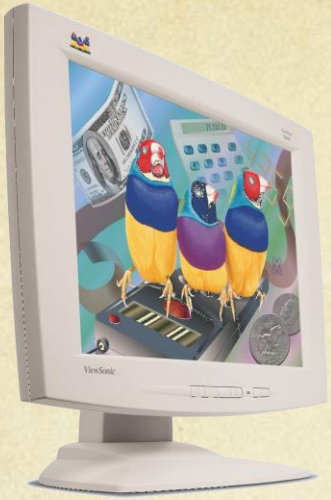
2: Video card converts digital data to analog signal

3: Analog signal sent via cable to CRT monitor

4: CRT separates signal into red, green, and blue signals

5: Electron guns fire color signals to front of CRT

6: Image displays



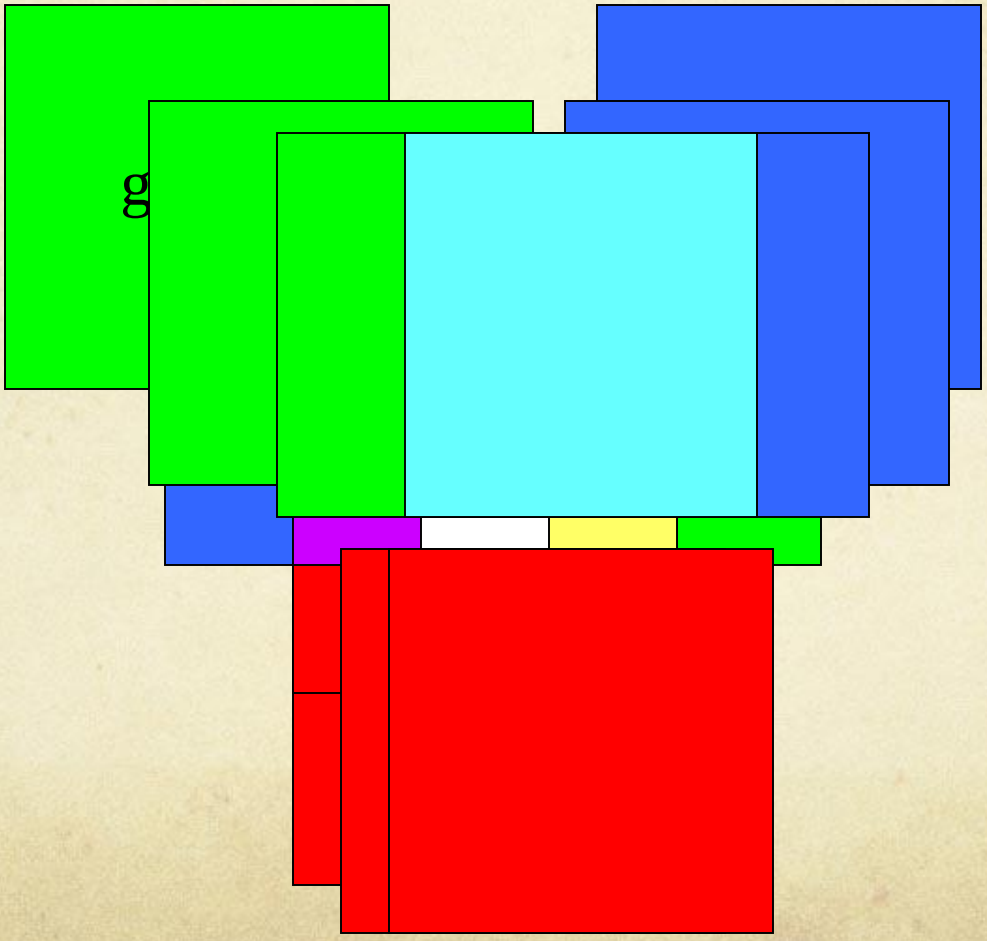
LCD
liquid crystal display

- LCD - have two sheets with liquid crystals in between.
- Liquid crystal molecules move like a liquid, but the molecules tend to point in the same direction, more like a solid.
- Liquid crystals tend to be sensitive to temperature and electric current.

Plasma Monitor

- Like an LCD, Gas plasma displays are a type of flat-panel display.
- Instead of liquid crystals, they have a gas sandwiched between the two panels .
- When voltage is applied, the gas releases UV light forming the image.

Additive colors - RGB



Display Quality

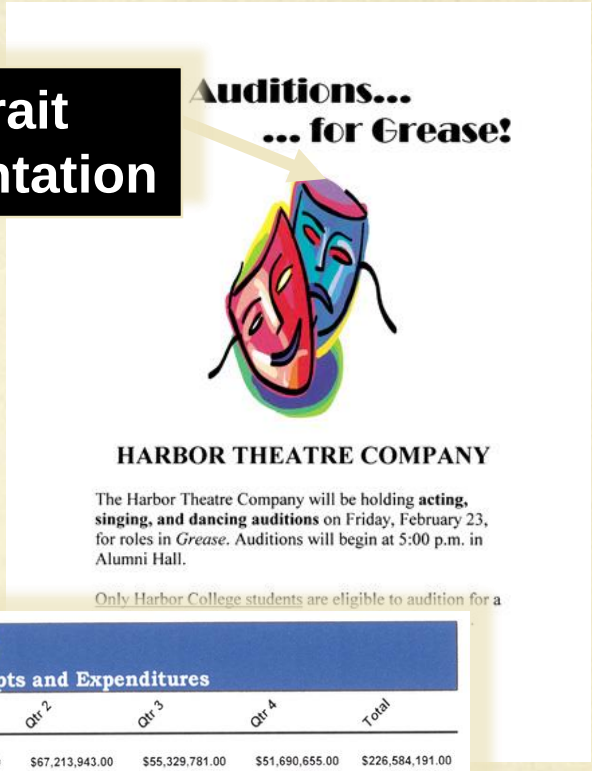
- Monitor size is measured on the diagonal.
- Resolution is expressed as the number of pixels – so two screens of the same size may not have the same resolution.
- Refresh rate is the number of times the images is redrawn on the screen.
- Dot pitch is the distance in millimeters between like pixels, the smaller the distance the sharper the image.

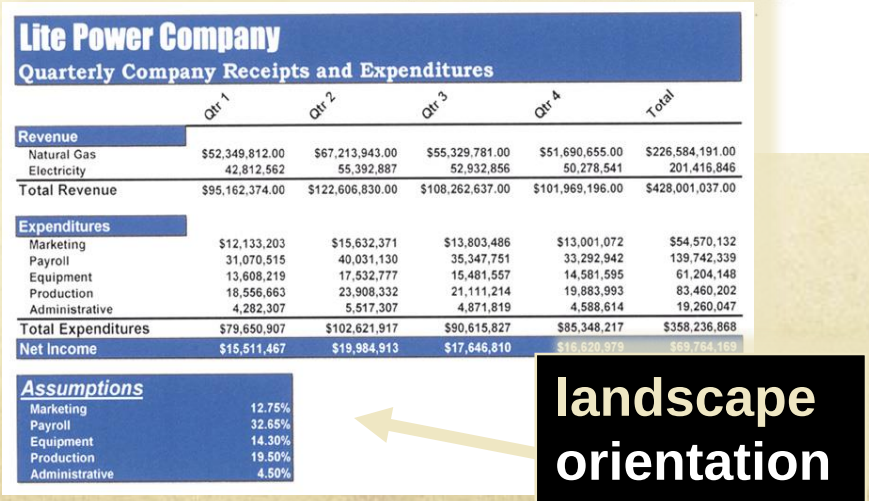
Terminals

- dumb terminal
- intelligent
- Special purpose

What is a printer?

- Output device that produces text and graphics on paper
- Result is hard copy, or printout
- Two orientations





Lite Power Company
Quarterly Company Receipts and Expenditures

	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Total
Revenue					
Natural Gas	$52,349,812.00	$67,213,943.00	$55,329,781.00	$51,690,655.00	$226,584,191.00
Electricity	42,812,562	55,392,887	52,932,856	50,278,541	201,416,846
Total Revenue	$95,162,374.00	$122,606,830.00	$108,262,637.00	$101,969,196.00	$428,001,037.00
Expenditures					
Marketing	$12,133,203	$15,632,371	$13,803,486	$13,001,072	$54,570,132
Payroll	31,070,515	40,031,130	35,347,751	33,292,942	139,742,339
Equipment	13,608,219	17,532,777	15,481,557	14,581,595	61,204,148
Production	18,556,663	23,908,332	21,111,214	19,883,993	83,460,202
Administrative	4,282,307	5,517,307	4,871,819	4,588,614	19,260,047
Total Expenditures	$79,650,907	$102,621,917	$90,615,827	$85,348,217	$358,236,868
Net Income	$15,511,467	$19,984,913	$17,646,810	$16,620,979	$69,764,169

Assumptions	
Marketing	12.75%
Payroll	32.65%
Equipment	14.30%
Production	19.50%
Administrative	4.50%

Impact Printers

- dot matrix – transferred image by pins striking ribbon
- Line printer – high speed impact printer that prints an entire line at a time (used by main frames)

Both use perforated paper with holes on the side (continuous form).

Inkjet printers

Sprays ink when an electrical charge moves through the print cartridge

How does an ink-jet printer work?

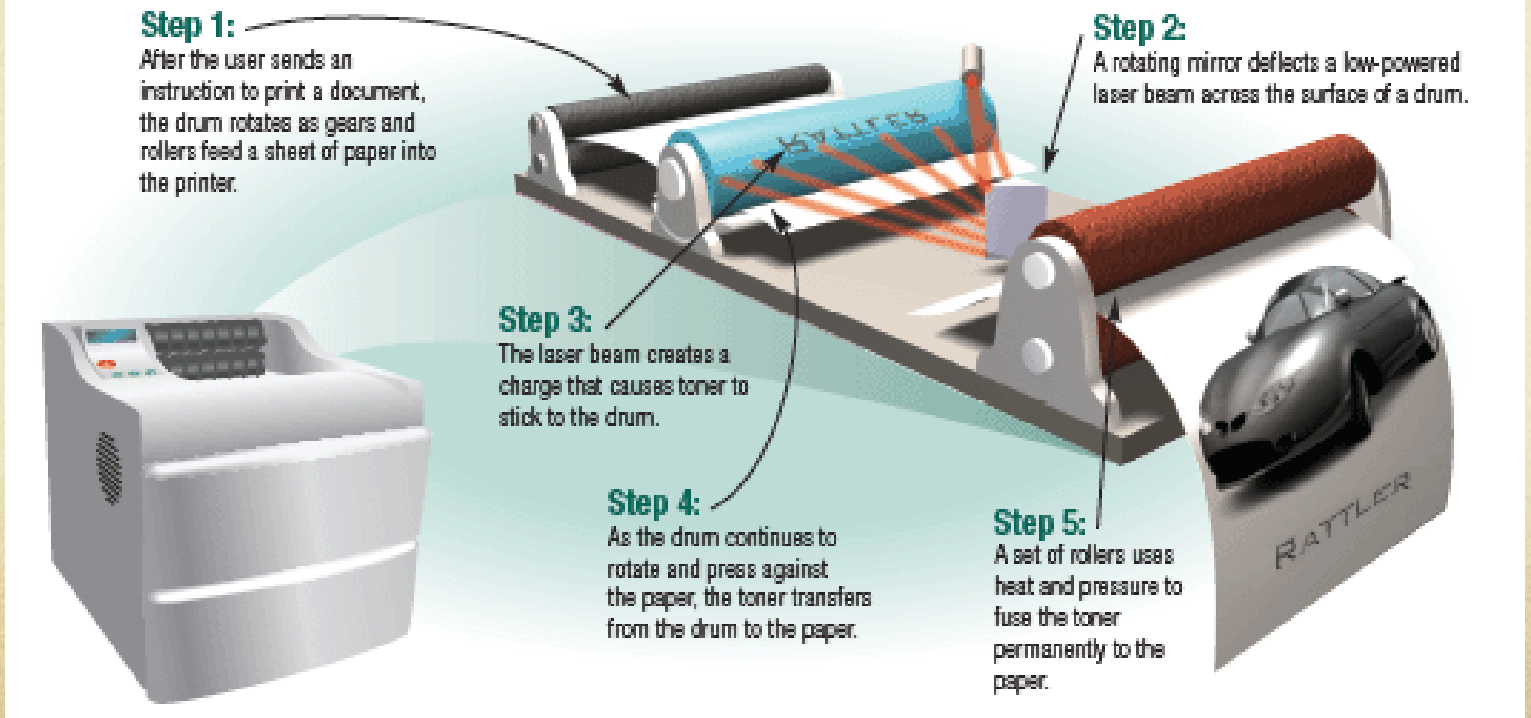
1. **Vapor bubble forces ink through nozzle**
2. **Ink Small resistor heats ink, causing ink to boil and form vapor bubble**
3. **drops onto paper**
4. **As vapor bubble collapses, fresh ink is drawn into firing chamber**

laser printer

- faster than inkjet, uses laser to create points of charge to which particles of ink with opposite charge (toner) stick.
- Heat and pressure fuse the toner to the page. Laser printers have motherboards, RAM and ROM.
- The entire page is saved in memory before it is printed.
- Printer also contains fonts in its memory.

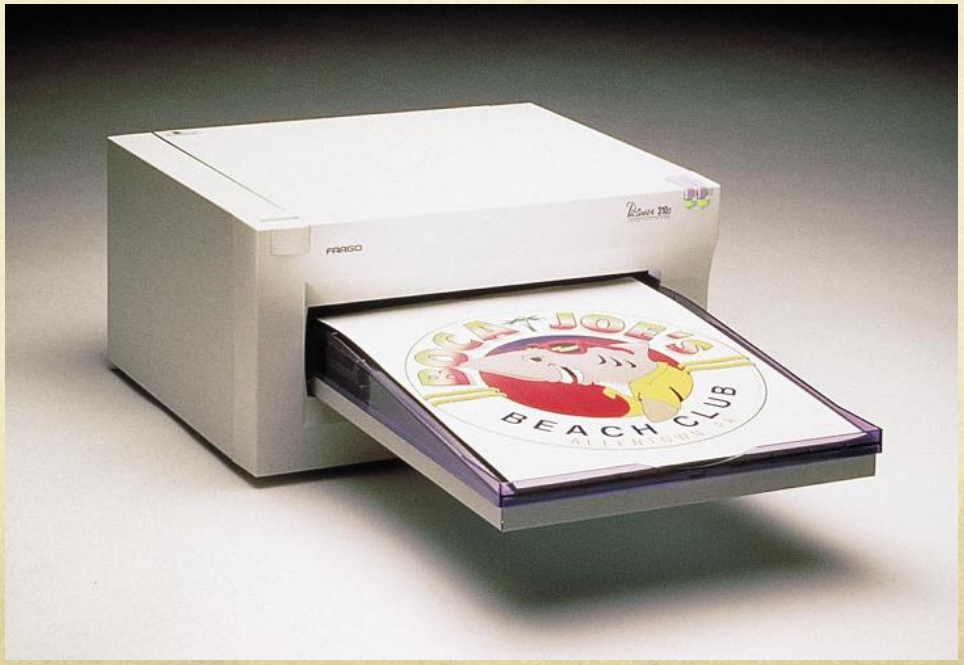
How does a laser printer work?

1. **Drum rotates as paper is fed through**
2. **Mirror deflects laser beam across surface of drum**
3. **Laser beam creates charge that causes toner to stick to drum**
4. **As drum rotates, toner transfers from drum to paper**
5. **Rollers use heat and pressure to fuse toner to paper**



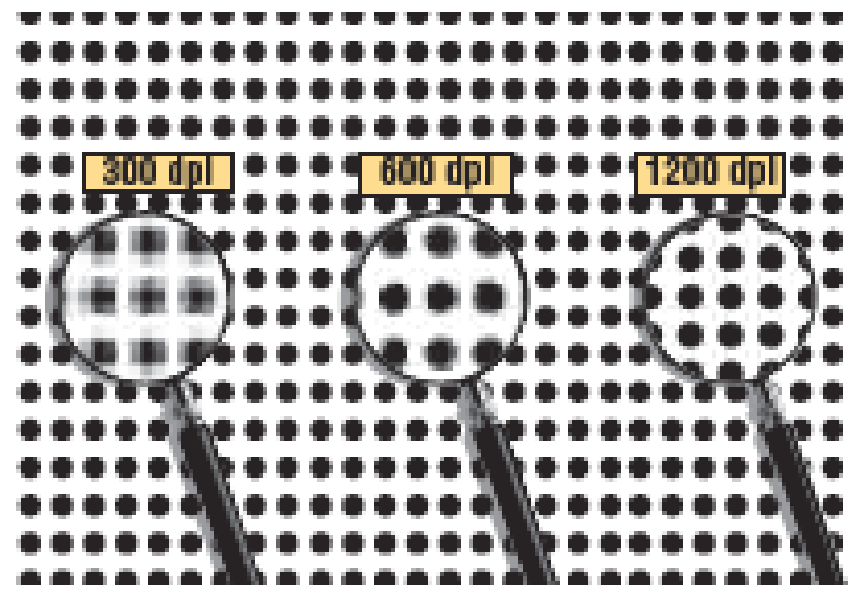
Thermal printers

- Generates images by pushing electrically heated pins against heat-sensitive paper
- Ideal for small devices, such as adding machines
- Images tend to fade over time

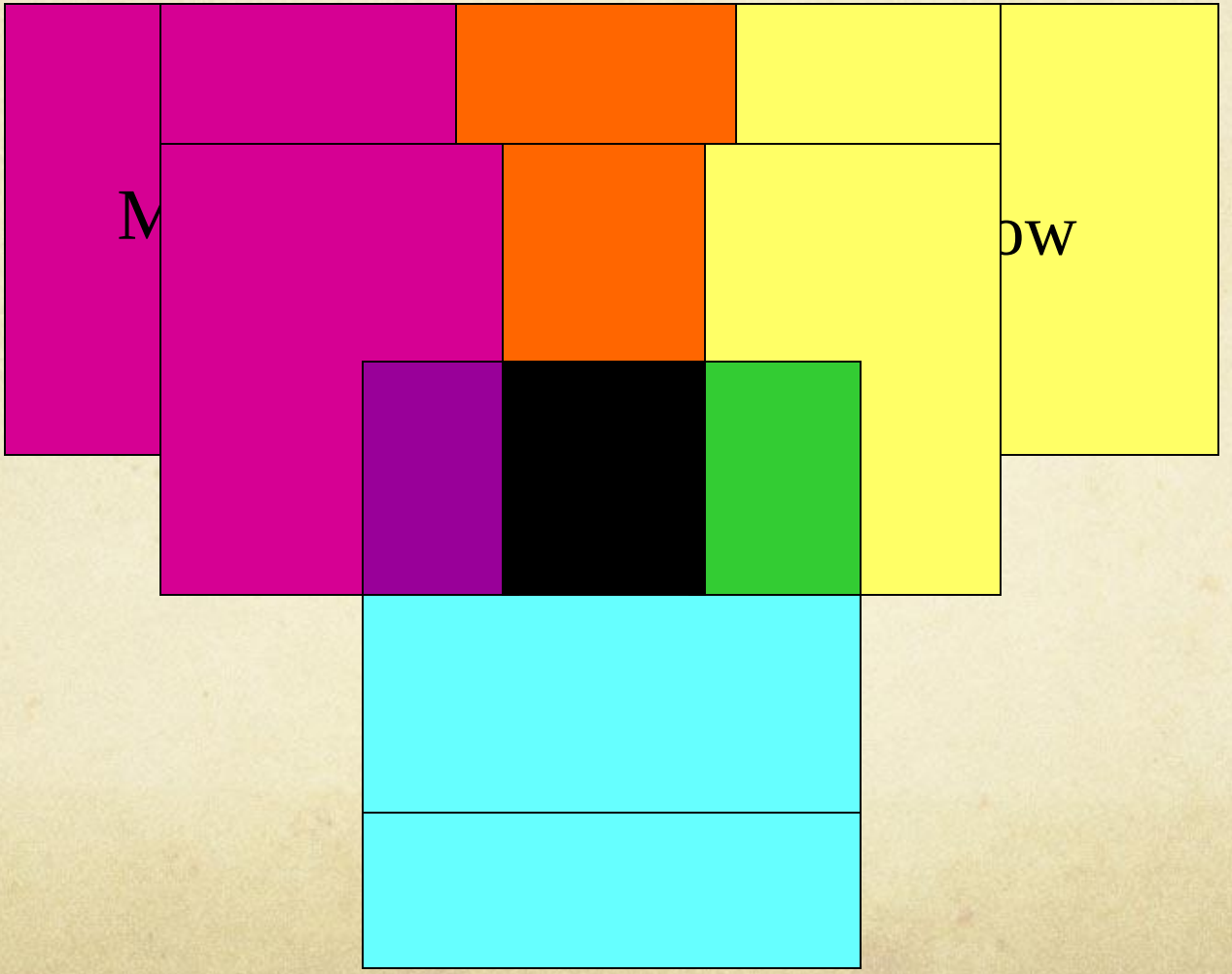


Plotters

produce high-quality drawings



Printer colors



Speakers, headsets and earbuds

- Computer component that produces music, speech, and other sounds
- Used for errors or other notification, audio like music or speech

Student should be able to:

- List the various types of input devices
- Explain how the various input devices work
- Explain the difference between speaker-independent and speaker-dependent voice recognition.
- List the 4 different types of output
- Explain how the various types of monitors work
- Explain what affects display quality
- Explain what a Terminal is
- Explain how the various types of printers work
- Explain what audio output devices are

Homework/Labs

- Read pages 43 – 55 on Storage
- Define any unfamiliar key terms in Chapter 2. Keep these definitions in your notes.