



## Display Devices

### Monitors

<b>CRT (Cathode Ray Tube)</b>	Older technology, bulky, high power consumption, but good color reproduction. Becoming obsolete.
<b>LCD (Liquid Crystal Display)</b>	Flat panel, lower power consumption, sharper image, but contrast ratio may not be as good as CRT. Common in laptops and desktop monitors.
<b>LED (Light Emitting Diode)</b>	LCD monitors that use LED backlighting. Even lower power consumption, brighter images, and longer lifespan compared to standard LCDs.
<b>OLED (Organic Light Emitting Diode)</b>	No backlight needed, each pixel emits its own light, resulting in excellent contrast ratios and vibrant colors. Used in high-end TVs and smartphones.
<b>Resolution</b>	Number of pixels displayed on the screen (e.g., 1920x1080 - Full HD). Higher resolution means sharper images.
<b>Refresh Rate</b>	The number of times per second the image is refreshed (Hz). Higher refresh rates (e.g., 144Hz) reduce motion blur, important for gaming.

### Printers and Plotters

#### Printers

<b>Inkjet Printers</b>	Sprays tiny droplets of ink onto paper. Good for photos and documents with color. Can be slow and ink can be expensive.
<b>Laser Printers</b>	Uses a laser to create an electrostatic image on a drum, which then attracts toner. Fast and efficient for text documents. More expensive upfront but lower cost per page.
<b>Thermal Printers</b>	Uses heat to create images on special thermal paper. Common in point-of-sale systems and label printers.
<b>Dot Matrix Printers</b>	Impact printers that use pins to strike an ink ribbon. Noisy and low-resolution, but can print on multi-part forms.
<b>Duplex Printing</b>	Printing on both sides of the paper automatically. Saves paper and reduces costs.
<b>PPM (Pages Per Minute)</b>	A measure of printer speed. Higher PPM means faster printing.

### Audio Output Devices

#### Speakers

<b>Types</b>	Internal speakers, external speakers, headphones, earbuds, soundbars.
<b>Frequency Response</b>	Range of frequencies a speaker can reproduce (Hz). Wider range means better sound quality.
<b>Impedance</b>	Measure of resistance to electrical current (Ohms). Must match the amplifier's output impedance.
<b>Sensitivity</b>	Measure of how loud a speaker will be at a given power level (dB). Higher sensitivity means louder sound.
<b>Wattage</b>	Power handling capability of the speaker. Higher wattage means the speaker can handle more power without distortion.

### Other Output Devices

### Projectors

<b>DLP (Digital Light Processing)</b>	Uses tiny mirrors to project images. Known for good contrast and fast response times.
<b>LCD Projectors</b>	Uses LCD panels to create images. Tend to be brighter and more energy-efficient, but may have lower contrast than DLP.
<b>LED Projectors</b>	Uses LEDs as a light source. Long lifespan and energy-efficient.
<b>Throw Ratio</b>	Distance required for the projector to display a certain image size. Short throw projectors can be placed closer to the screen.
<b>Lumens</b>	Measure of brightness. Higher lumens are better for well-lit environments.

#### Plotters

<b>Pen Plotters</b>	Uses pens to draw on paper. Capable of high-precision drawings.
<b>Electrostatic Plotters</b>	Uses electrostatic charge to create images. Faster than pen plotters.
<b>Inkjet Plotters</b>	Uses inkjet technology for large-format printing. Commonly used for posters and banners.
<b>Applications</b>	Used for creating technical drawings, architectural plans, and other large-format graphics.

#### Sound Cards

<b>Function</b>	Converts digital audio data into analog signals that can be played through speakers or headphones.
<b>Internal vs. External</b>	Internal sound cards plug into the motherboard. External sound cards connect via USB or other ports.
<b>DAC (Digital-to-Analog Converter)</b>	Essential component of a sound card that converts digital signals to analog.
<b>Sampling Rate</b>	Number of samples taken per second (kHz). Higher sampling rates result in better audio quality.
<b>Bit Depth</b>	Number of bits used to represent each sample. Higher bit depth results in better dynamic range.

## Force Feedback Devices

<b>Joysticks and Steering Wheels</b>	Provide tactile feedback to the user, simulating forces and vibrations in games and simulations.
<b>Haptic Devices</b>	Provide tactile sensations, used in medical training, virtual reality, and robotics.

## GPS

<b>Global Positioning System (GPS)</b>	Receives signals from satellites to determine location and provide navigational information.
<b>Applications</b>	Navigation systems in cars, smartphones, and other devices.

## Braille Display

<b>Function</b>	Displays text in Braille, allowing visually impaired users to read digital content.
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## 3D Printers

<b>Stereolithography (SLA)</b>	Uses a UV laser to cure liquid resin layer by layer.
<b>Fused Deposition Modeling (FDM)</b>	Melts and extrudes plastic filament to build objects layer by layer.
<b>Selective Laser Sintering (SLS)</b>	Uses a laser to fuse powder materials together.
<b>Applications</b>	Prototyping, manufacturing, medical devices, and more.