

---

# EXTERNAL HARDWARE DEVICES

---

## Digital camera

Light is focused by lens on a sensor (CCD or CMOS) made of transistors. Each on these uses an ADC to quantise the amount of light coming into it. Transistors are covered with RGB filters in order to derive colour values for each pixel.

## Barcode reader

A laser is shined on the bar-code and the reader analyses the light reflected. Since white bars reflect more than black bars the sequence of bars and therefore the binary pattern of the code is retrieved. Then, the characters of the code are found from the binary pattern and the check digit is controlled. Similar is the technology of QR code scanners.

## RFID (Radio Frequency Identifier)

The RFID reader emits radio waves to which the transponder can answer sending or receiving data through radio waves. The RFID tag can either be active, therefore with a battery, or passive, therefore receiving energy from the reader through radio waves.

## Laser printers

The printer processes the bitmap from the page description, using laser it traces out on the negatively charged rotating drum the mage by reversing the charge. Then the negatively charged toner is attracted by those areas in the drum positively charged. Finally, the charge is attracted by charge from the drum to the paper and then the toner is fused on the paper.

## Secondary storage devices

### *Magnetic hard disk*

Formed by circular disks divided in sectors and tracks which are formed by particles that act as tiny magnets inducing current in the reader's head. This current is read as 0 or 1 depending on the alignment of the particles.

### *Optical disk*

Formed by a series of pits and lands in series onto a spiral track from the middle of the disk to the end. The reader shines a laser beam and reads the pits and lands measuring how much light is reflected (lands reflect more). Writable optical disks use a photosensitive translucent dye.

### *SSD (Solid state drive)*

Formed by NAND flash memory and a controller that manages pages, blocks and complexities of writing. It is based on floating gate transistors that trap and store charge.

HD	SSD
Cheaper	Faster
Higher capacity	Low latency

