

## Optical Discs and Drives Notes

*Much of the information in these notes comes from the following sections of the howstuffworks web site.*

1. <http://electronics.howstuffworks.com/cd.htm>
2. <http://communication.howstuffworks.com/analog-digital.htm>.
3. <http://computer.howstuffworks.com/cd-burner.htm>
4. <http://electronics.howstuffworks.com/dvd2.htm> (just this page for DVDs)

ADC – analog to digital converter – converts analog signals into digital data.

DAC – digital to analog converter – converts digital data to an analog signal.

DVDR – digital versatile (video) disc recordable – a DVD on which you can record information one time.

CDRW – compact disc re-writable – a cd on which you can record, erase and then re-record.

CDs are primarily made of polycarbonate plastic.

Data is physically arranged on a compact disc in a single spiral track of tiny bumps.

The spiral track of bumps on a CD would be about \_\_\_\_\_ miles long if it were in a straight line.

Digital information is stored on compact discs.

Reflective aluminum coats the polycarbonate plastic on a CD, making it readable by CD drives.

As a drive reads a CD and moves from the center to the outer edge of the disc, the CD's spinning speed decreases.

Acrylic is put onto the aluminum to protect it after the aluminum is put onto the polycarbonate plastic.

A millimeter is a thousandth of a meter, a micrometer or micron is a millionth of a meter and a nanometer is a billionth of a meter.

To create digital data, pits are stamped into CDs and DVDs. The pits represent zeroes and the part without the pit, called the lands, represent ones.

A drive motor spins the disc. This motor is precisely controlled to rotate between 200 and 500 rpm depending on which track is being read.

A laser and a lens system focus in on and read the bumps.

A tracking mechanism moves the laser assembly so that the laser's beam can follow the spiral track.

CD-Rs don't have any bumps or flat areas at all. Instead, they have a smooth reflective metal layer, which rests on top of a layer of photosensitive dye.

The write laser darkens spots of a CDR where the bumps would be in a conventional CD, forming non-reflecting areas that become the zeroes, all unaffected areas remain translucent and thus can reflect the laser creating the ones.

CDRW discs use phase shifts in a special compound to create ones and zeroes. When the compound is in a crystalline state, it is translucent so light can shine through to the metal layer above and reflect back to the laser assembly. When the compound is melted into an amorphous state, it becomes opaque, making the area non-reflective.

Regardless of the type of media (CD, CDR, CDRW) each non-reflective area indicates a zero in the digital code and each reflective area indicates a one.

Single-sided single layer DVDs have a capacity of 4.7GB, single-sided double layer DVDs have a capacity of 8.5GB and double-sided double layer DVDs have a capacity of 17GB.