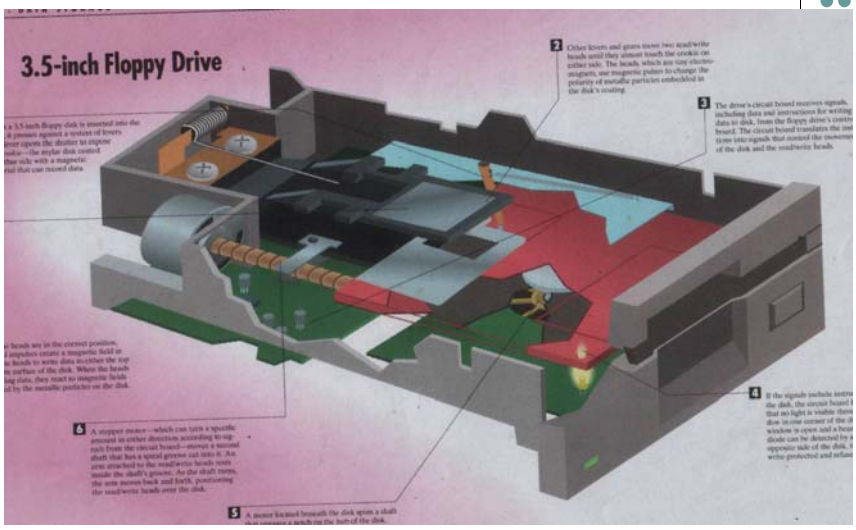
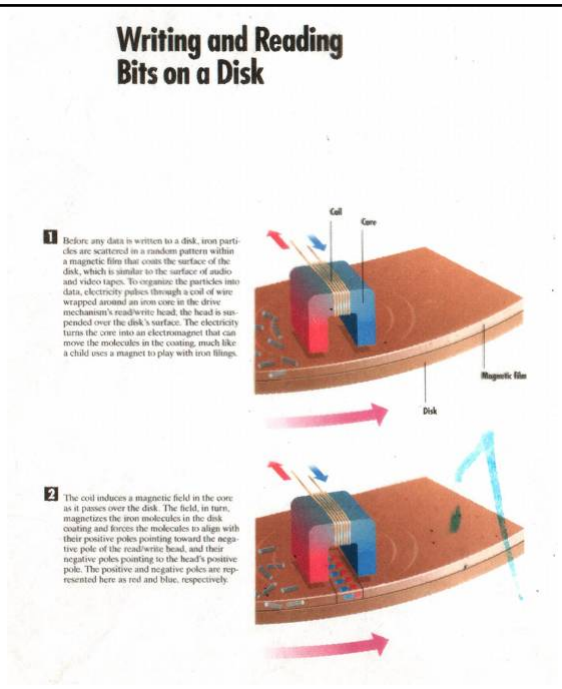
وحدات التخزين فى الحاسب
STORAGE UNITS

د / احمد وحيد

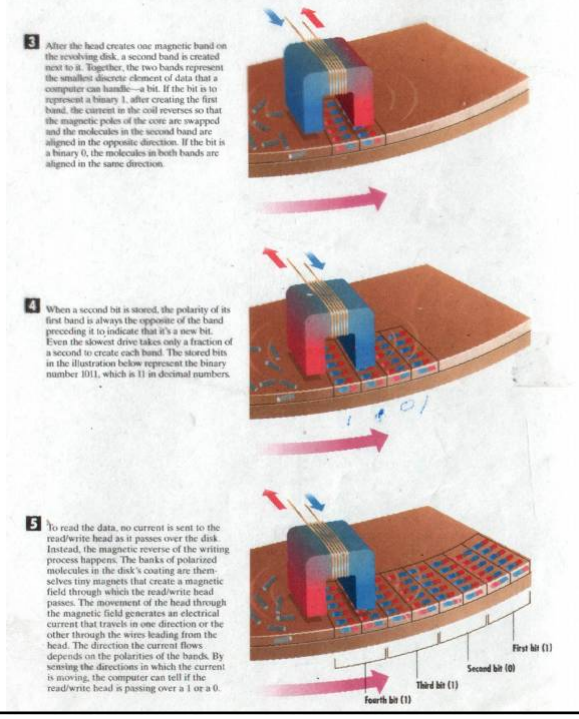


Writing and Reading Bits on a Disk



1 Before any data is written to a disk, iron particles are scattered in a random pattern within a magnetic film that coats the surface of the disk, which is similar to the surface of audio and video tapes. To organize the particles into data, electricity pulses through a coil of wire wrapped around an iron core in the drive mechanism's read/write head; the head is suspended over the disk's surface. The electricity turns the core into an electromagnet that can move the molecules in the coating, much like a child uses a magnet to play with iron filings.

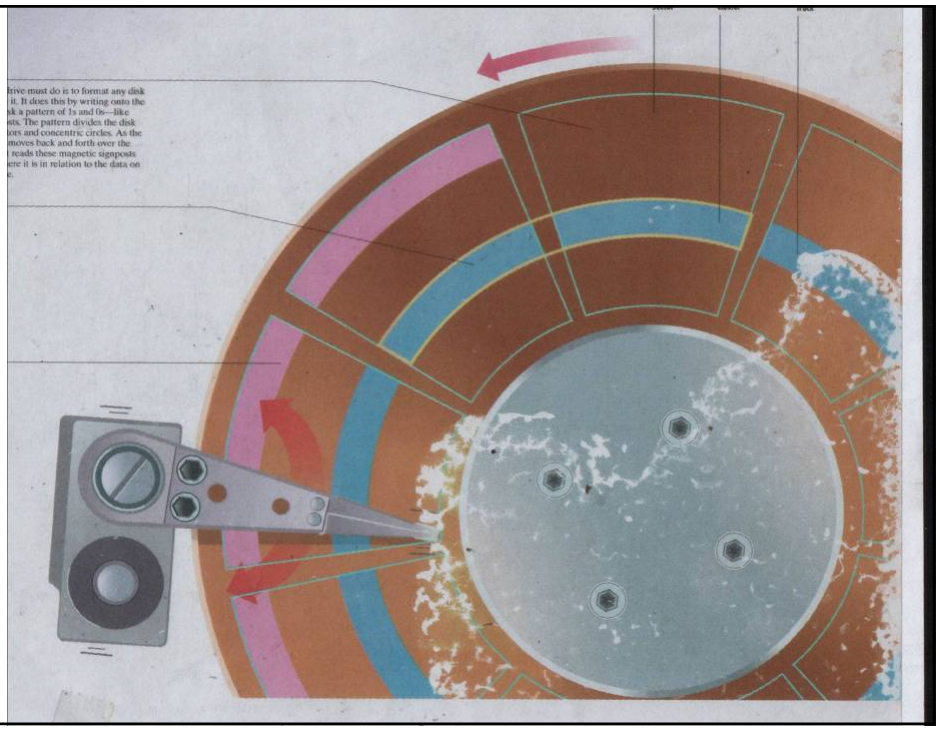
2 The coil induces a magnetic field in the core as it passes over the disk. The field, in turn, magnetizes the iron molecules in the disk coating and forces the molecules to align with their positive poles pointing toward the negative pole of the read/write head, and their negative poles pointing to the head's positive pole. The positive and negative poles are represented here as red and blue, respectively.

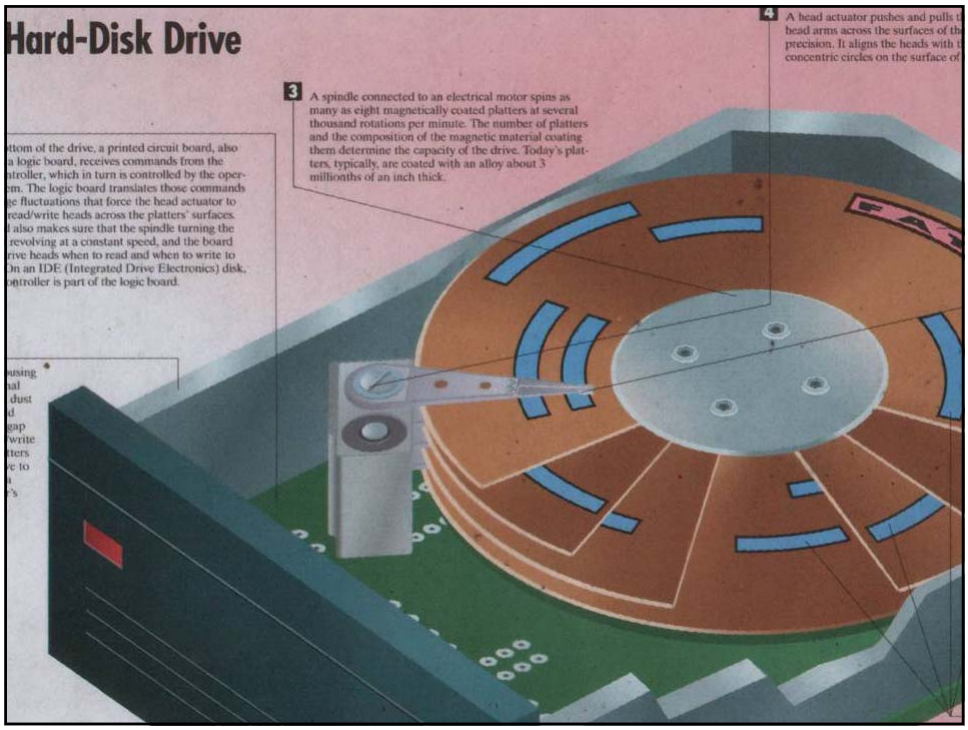


3 After the head creates one magnetic band on the revolving disk, a second band is created next to it. Together, the two bands represent the smallest discrete element of data that a computer can handle—a bit. If the bit is to represent a binary 1, after creating the first band, the current in the coil reverses so that the magnetic poles of the core are swapped and the molecules in the second band are aligned in the opposite direction. If the bit is a binary 0, the molecules in both bands are aligned in the same direction.

4 When a second bit is stored, the polarity of its first band is always the opposite of the band preceding it to indicate that it's a new bit. Even the slowest drive takes only a fraction of a second to create each band. The stored bits in the illustration below represent the binary number 1011, which is 11 in decimal numbers.

5 To read the data, no current is sent to the read/write head as it passes over the disk. Instead, the magnetic reverse of the writing process happens. The banks of polarized molecules in the disk's coating are themselves tiny magnets that create a magnetic field through which the read/write head passes. The movement of the head through the magnetic field generates an electrical current that travels in one direction or the other through the wires leading from the head. The direction the current flows depends on the polarities of the bands. By sensing the directions in which the current is moving, the computer can tell if the read/write head is passing over a 1 or a 0.


rive must do is to format any disk
it. It does this by writing onto the
sk a pattern of 1s and 0s—like
sts. The pattern divides the disk
ors and concentric circles. As the
moves back and forth over the
reads these magnetic signposts
ere it is in relation to the data on


Hard-Disk Drive
3
A spindle connected to an electrical motor spins as many as eight magnetically coated platters at several thousand rotations per minute. The number of platters and the composition of the magnetic material coating them determine the capacity of the drive. Today's platters, typically, are coated with an alloy about 3 millionths of an inch thick.
4
A head actuator pushes and pulls t
head arms across the surfaces of th
precision. It aligns the heads with t
concentric circles on the surface of
ttom of the drive, a printed circuit board, also
a logic board, receives commands from the
ntroller, which in turn is controlled by the oper-
m. The logic board translates those commands
ge fluctuations that force the head actuator to
read/write heads across the platters' surfaces.
also makes sure that the spindle turning the
revolving at a constant speed, and the board
rive heads when to read and when to write to
n an IDE (Integrated Drive Electronics) disk,
ntroller is part of the logic board.
using
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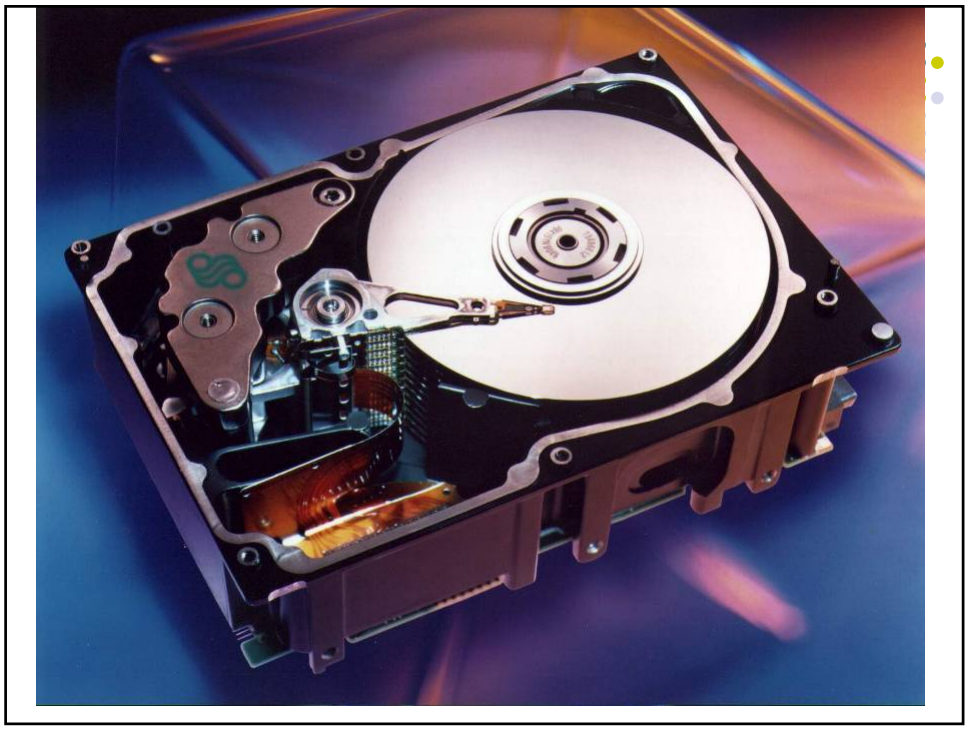
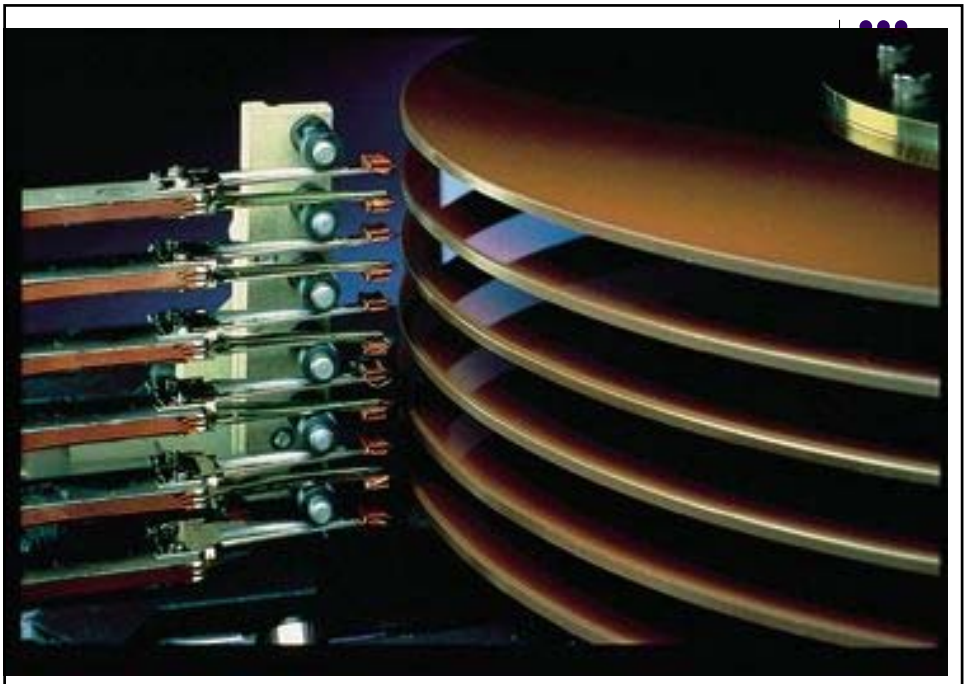
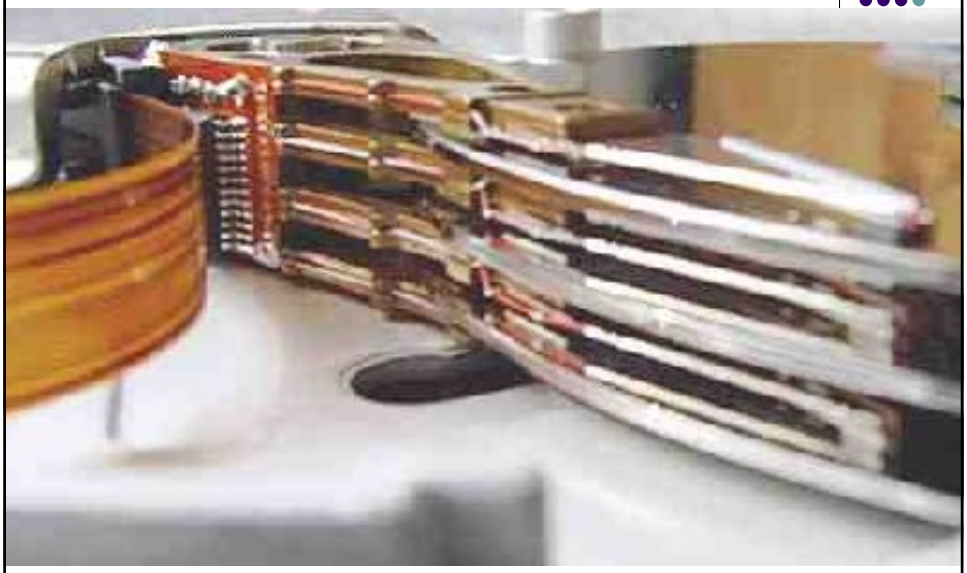
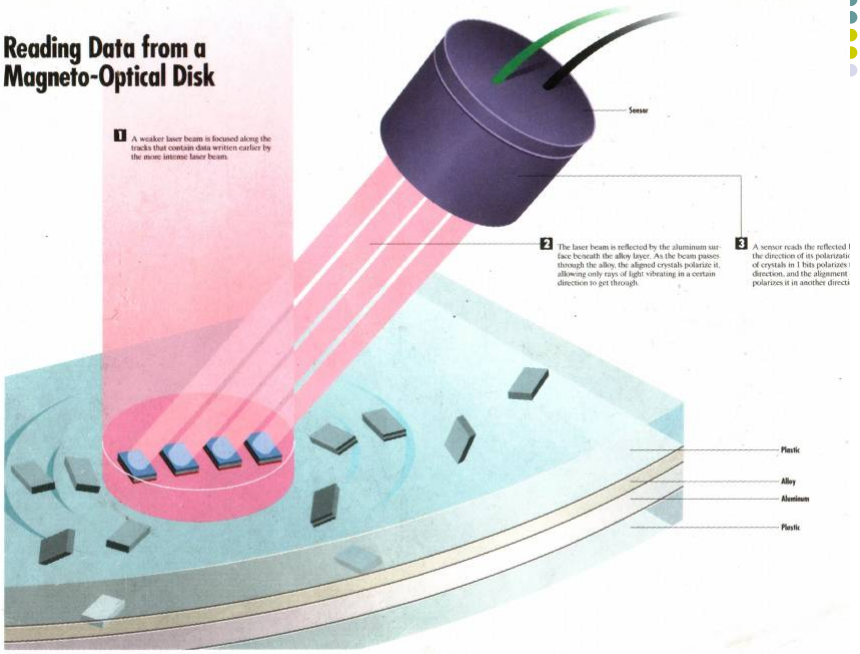
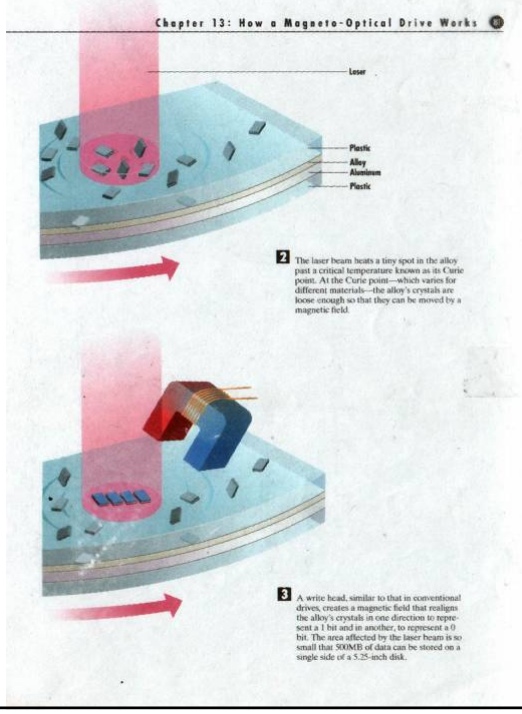
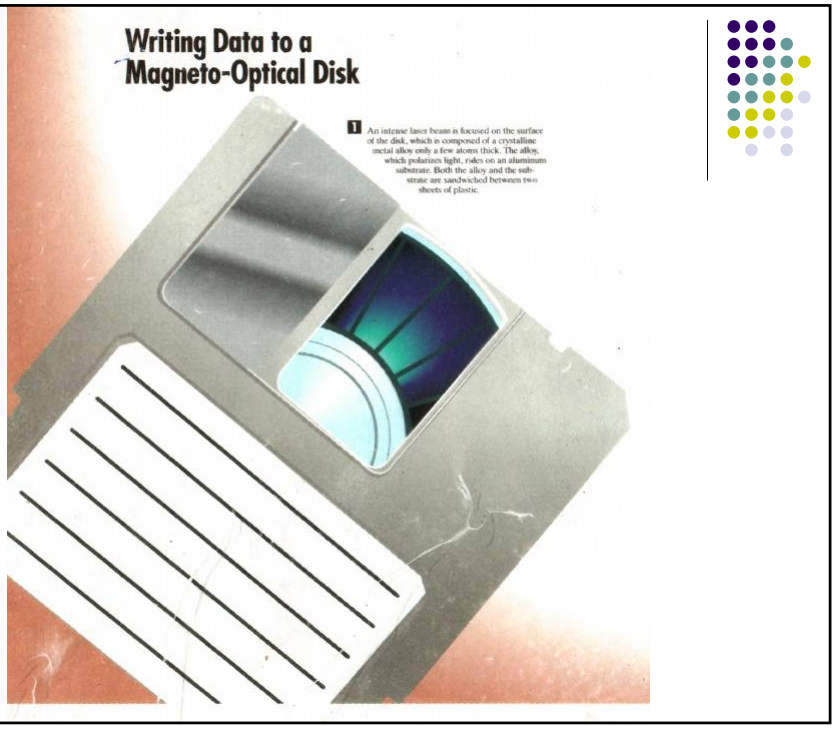


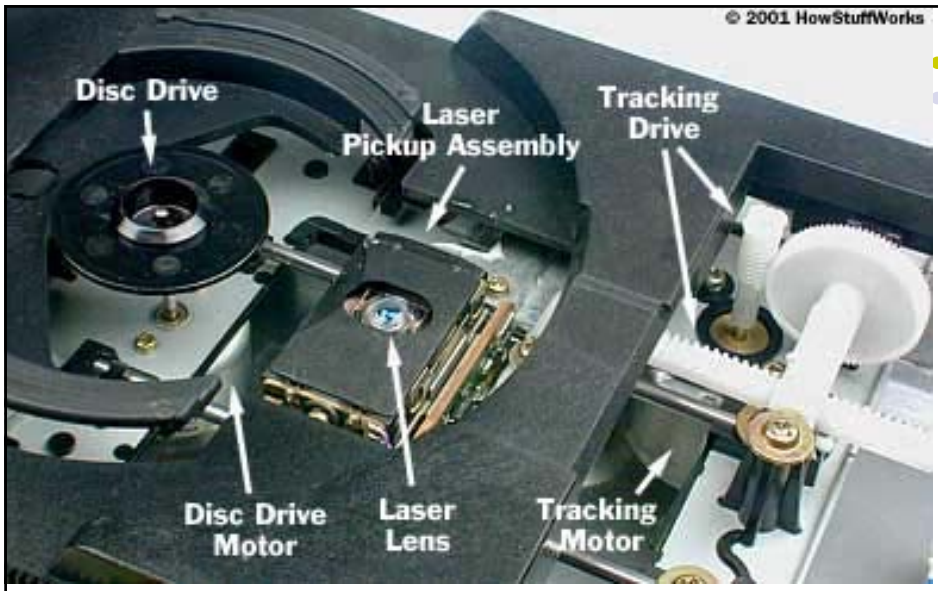





Reading Data from a Magneto-Optical Disk
1 A weaker laser beam is focused along the tracks that contain data written earlier by the more intense laser beam.
Sensor
2 The laser beam is reflected by the aluminum surface beneath the alloy layer. As the beam passes through the alloy, the aligned crystals polarize it, allowing only rays of light vibrating in a certain direction to get through.
3 A sensor reads the reflected l the direction of its polarizati of crystals in 1 bits polarizes direction, and the alignment polarizes it in another directi
Plastic
Alloy
Aluminum
Plastic


Laser
Plastic
Alloy
Aluminum
Plastic
2 The laser beam heats a tiny spot in the alloy past a critical temperature known as its Curie point. At the Curie point—which varies for different materials—the alloy's crystals are loose enough so that they can be moved by a magnetic field.
3 A write head, similar to that in conventional drives, creates a magnetic field that realigns the alloy's crystals in one direction to represent a 1 bit and in another, to represent a 0 bit. The area affected by the laser beam is so small that 500MB of data can be stored on a single side of a 5.25-inch disk.


Writing Data to a
Magneto-Optical Disk
1 An intense laser beam is focused on the surface of the disk, which is composed of a crystalline metal alloy only a few atoms thick. The alloy, which polarizes light, rides on an aluminum substrate. Both the alloy and the substrate are sandwiched between two sheets of plastic.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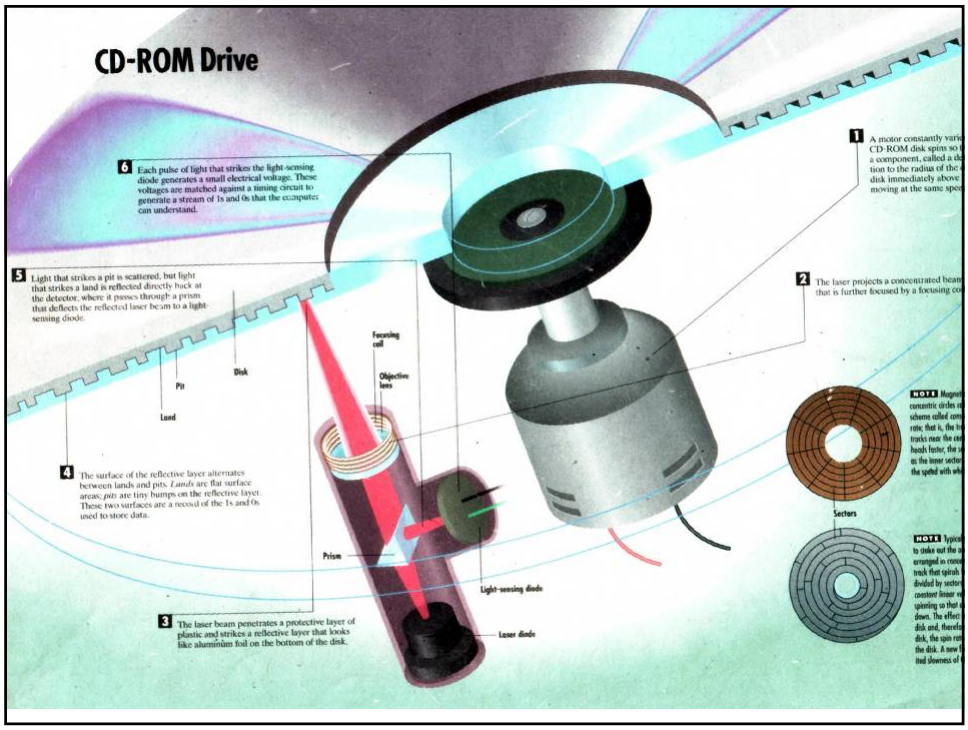
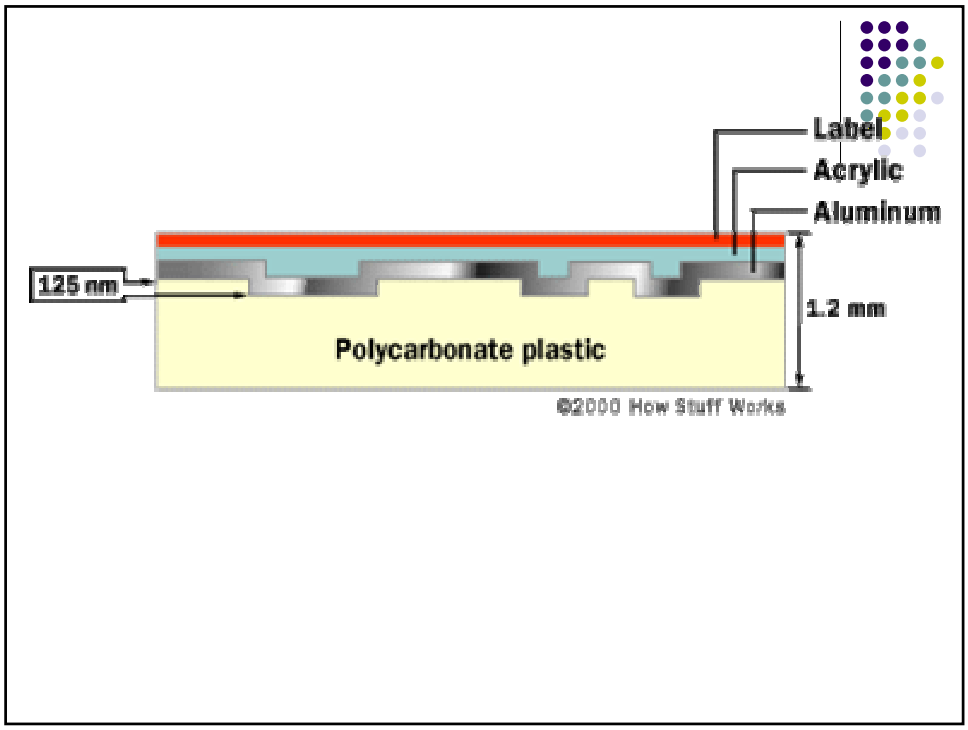
Disc Drive
Laser Pickup Assembly
Tracking Drive
Disc Drive Motor
Laser Lens
Tracking Motor


CD-ROM Drive
6 Each pulse of light that strikes the light-sensing diode generates a small electrical voltage. These voltages are matched against a timing circuit to generate a stream of 1s and 0s that the computer can understand.
5 Light that strikes a pit is scattered, but light that strikes a land is reflected directly back at the detector, where it passes through a prism that deflects the reflected laser beam to a light-sensing diode.
4 The surface of the reflective layer alternates between lands and pits. Lands are flat surface areas; pits are tiny bumps on the reflective layer. These two surfaces are a record of the 1s and 0s used to store data.
3 The laser beam penetrates a protective layer of plastic and strikes a reflective layer that looks like aluminum foil on the bottom of the disk.
Land
Pit
Disk
Focusing coil
Objective lens
Prism
Light-sensing diode
Laser diode
1 A motor constantly varies
CD-ROM disk spins so t
a component, called a de
tion to the radius of the
disk immediately above
moving at the same speed
2 The laser projects a concentrated beam
that is further focused by a focusing co
Sectors


Label
Acrylic
Aluminum
125 nm
1.2 mm
Polycarbonate plastic
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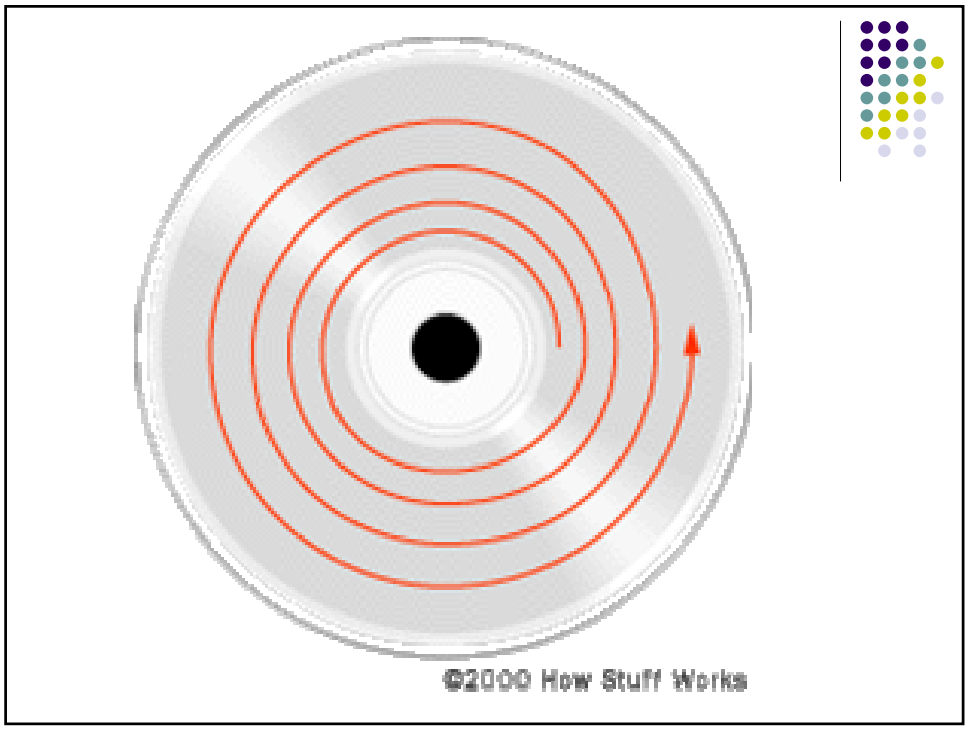
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