Chapter 08: The Memory System

Lesson 18:

Peripheral devices for memory— Optical Disks CDROM Memories

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Objective

- Understand CD structure using polycarbonate layer with an organic dye on an aluminum base
- Learn how CD stores 0s and 1s by pits and lands on the tracks

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Optical disk CD (compact disk) in Memory system

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Optical disk CD (compact disk) in Memory system

- Read-only memory
- Stores once written large amounts of data
- Moved easily from one place to another
- Cost of storage is as low as $0.10–0.20 per 700 MB CD

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CD storing 700 MB on the tracks

- Thin, just ~ 1.2 mm (1/8 th of a cm).
- Diameter is 12 cm
- It has 6000 tracks (separated by 1.3 *m*m)
- Tracks more in density than magnetic disk tracks

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CDs types

- CD and CD-R
- The CD-R is recordable in a computer system
- The unused portion of the CD can be used again for writing
- Re-write CDs have also become available recently

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Optical principles

- A laser beam has a property of high coherence and very fine aperture beam and negligible beam divergence

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Reading from the CD

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Reading from the CD

- On a spinning CD, two laser beams of the same wavelength are reflecting light from two places and get focused and are allowed to fall on a photo-detector

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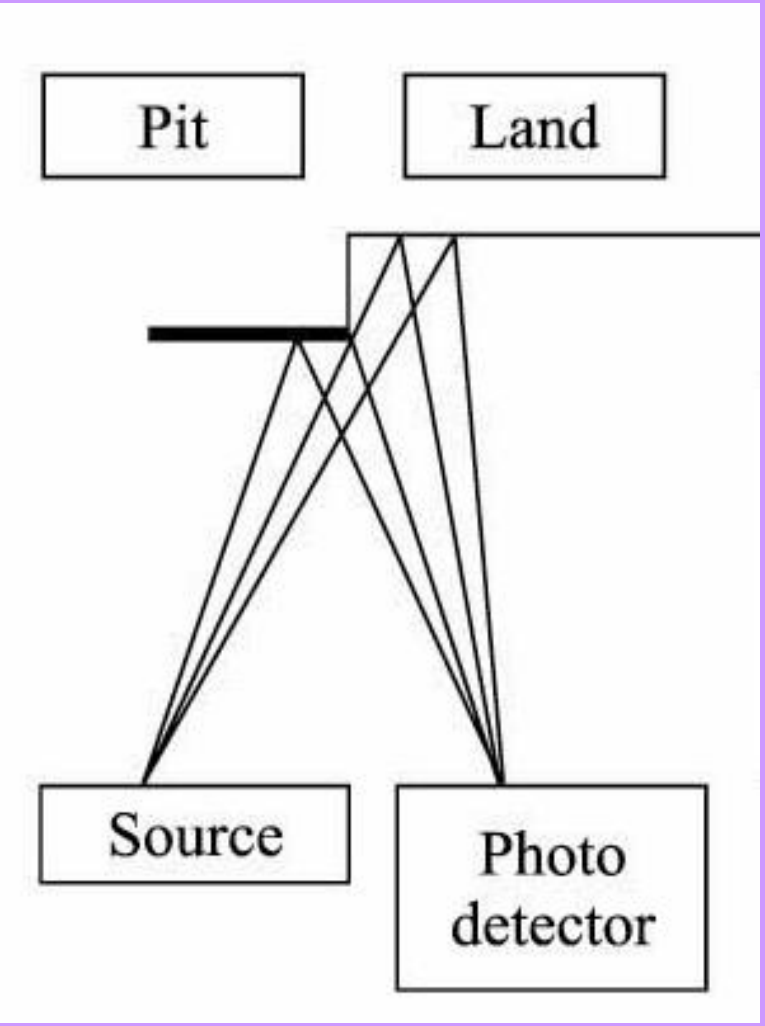
The light reflected from pit to land transition in the moving CD



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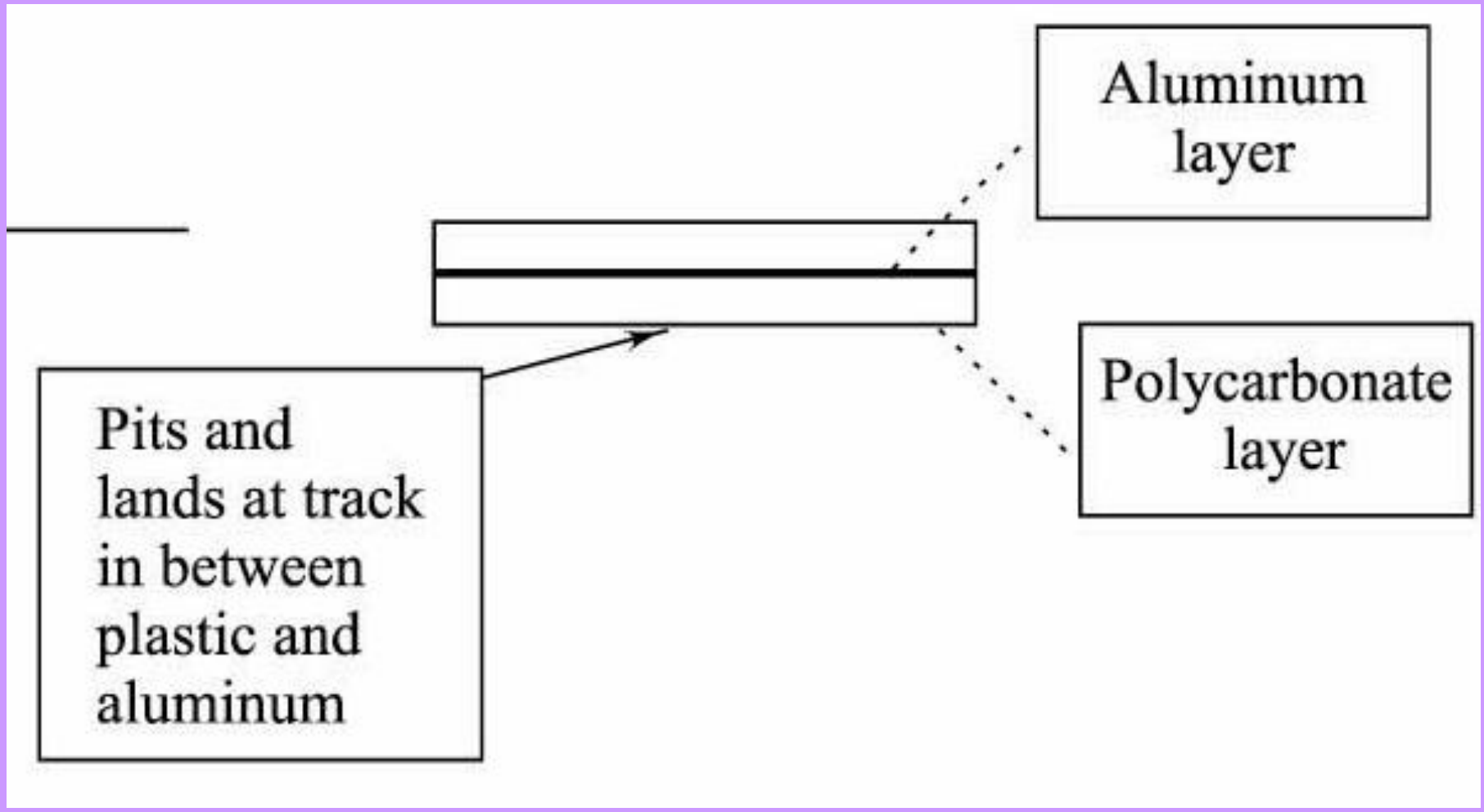
The CD structure



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In-phase and 180° out of phase beam

- The reflected beam can be either in-phase or in 180° out of phase at a given instance
- When beams of 180° phase differences reach the photodetector, their amplitudes cancel and therefore the combined effect is zero intensity
- When the in-phase beams fall, the combined wave amplitudes double and thus intensity is reinforced to 4 times than that of a single beam

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Many tracks on the CD

- Each CD track stores a large number of pits and lands
- The beams therefore produced from the pits and lands on the spinning plate give the output of 1s and 0s at the instances explained later

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The change from land to pit

1. Affects the light such that the reflected beam is four times the single beam light
- The photodetector generates the outputs, but again it is the high saturation photocurrent, which corresponds to logic 1

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A pit or land reflection

2. No change in reflection of light waves

- Hence, the photodetector, which receives the light beams, will again show saturation photocurrent
- The photodetector generates the outputs corresponding to 1 again

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Change from pit to land

3. Affects the light such that there are now two beams one from pit and another from land, and both are in 180° phase-difference when they reach the photodetector

- Therefore the output will be 0

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Writing to the CD

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Writing the pits and lands

- Using laser beam
- Beam falls on the optical disk in a programmed manner
- Produces a pit followed by a land when writing 0
- Laser light burns the polycarbonate, which has an organic dye

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Writing the pits and lands

- When the laser beam falls the cross section, it burns and produces a pit
- Burning means that the organic dye becomes opaque and does not transmit light up to back of the aluminum

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Writing the pits and lands

- When the laser beam falls the cross section, it burns and produces a pit
- Burning means that the organic dye becomes opaque and does not transmit light up to back of the aluminum

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Summary

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We learnt

- CD organisation using polycarbonate layer with an organic dye on an aluminum base
- Use of laser beam such that CD stores pits and lands on the tracks

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We learnt

- When the laser beam falls the cross section, it burns and produces a pit when the organic dye becomes opaque and does not transmit light up to back of the aluminum
- Change from a pit to land on a CD track gives 0 output from photodetector due to two out-of-phase optical beams at the transition point else there is 1 output from land to pit transition or on land

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End of Lesson 18 on

Peripheral devices for memory– Optical Disks

CDROM Memories

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