



Computer Fundamentals

Dr. Safdar Nawaz Khan Marwat
DCSE, UET Peshawar

Lecture 11



Outline

➤ Types of storage devices



Storage Devices

- Store data when computer is off
- Two processes
 - ❑ Writing data
 - ❑ Reading data
- Storage media
 - ❑ Media is the material storing data
 - ❑ Storage devices manage media
 - Magnetic devices use a magnet
 - Optical devices use lasers
 - Solid-state devices have physical switches



Magnetic Storage Devices

- Most common form of storage
 - ❑ Hard drives, floppy drives, tape
- All magnetic drives work the same



Floppy Disk

Hard Disk

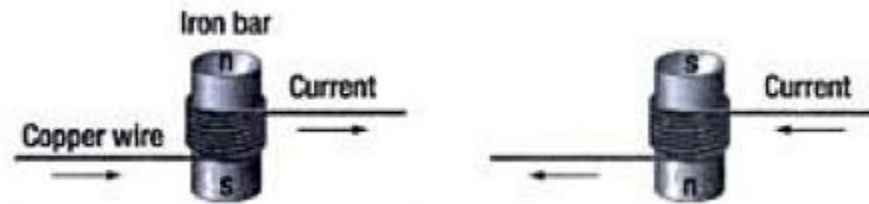
Tape



Magnetic Storage Devices (cont.)

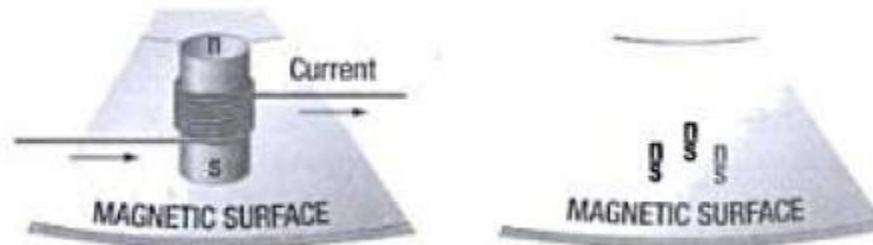
➤ Making a magnet

- ❑ Polarity (N/S) determined by current direction



➤ Electromagnetic induction

- ❑ Placing electromagnet against magnetic surface induces magnetic field





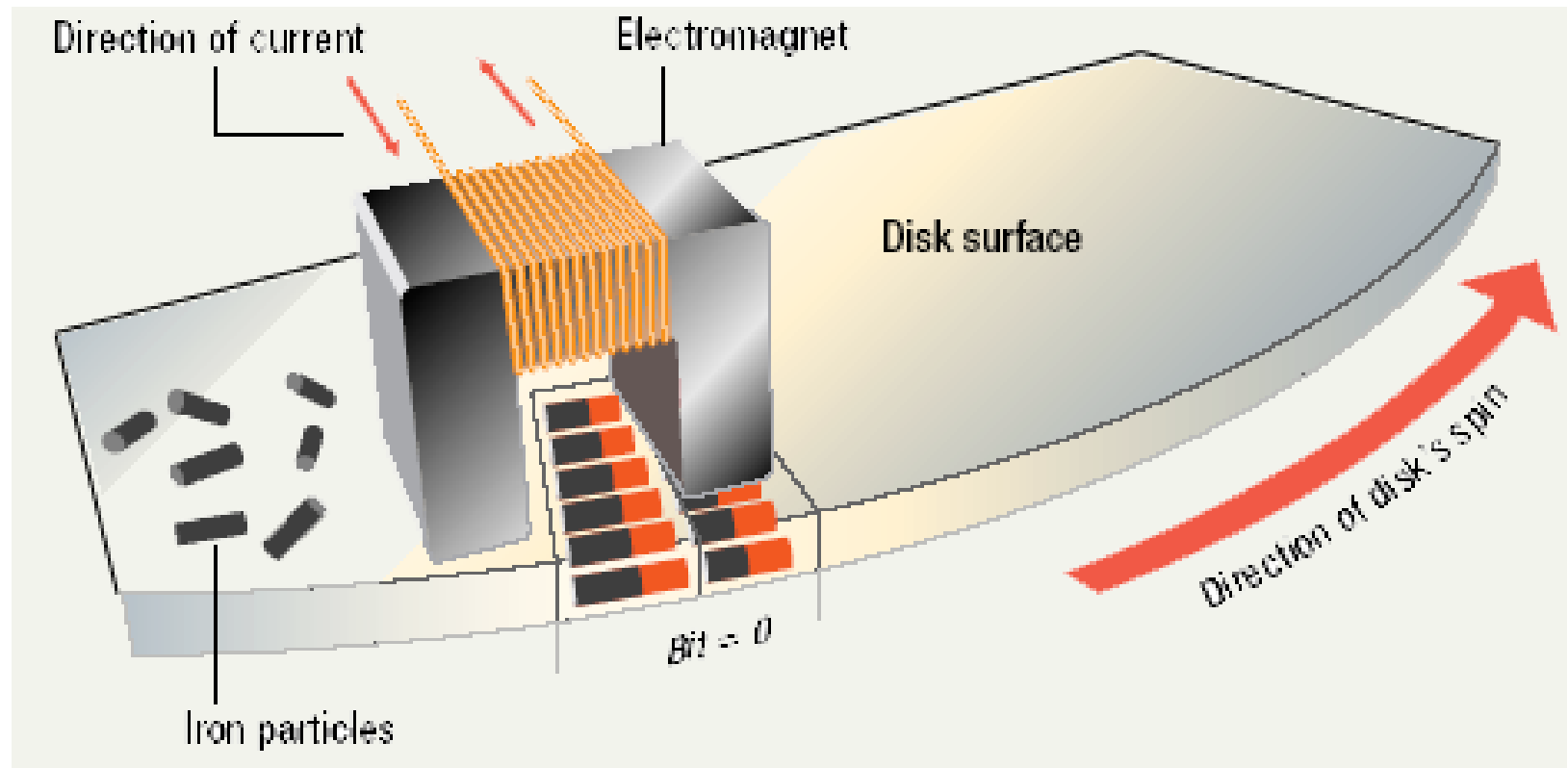
Magnetic Storage Devices (cont.)

- Data storage and retrieval
 - ❑ Media is covered with iron oxide
 - ❑ Read/write head is a magnet
 - ❑ Magnet writes charges on the media
 - Positive charge is a 1 (if N is used)
 - Negative charge is a 0 (if S is used)
 - ❑ Magnet reads charges
 - ❑ Drive converts charges into binary
 - ❑ Better than transistor for 0 and 1 as continuous power not required



Magnetic Storage Devices (cont.)

➤ Data retrieval

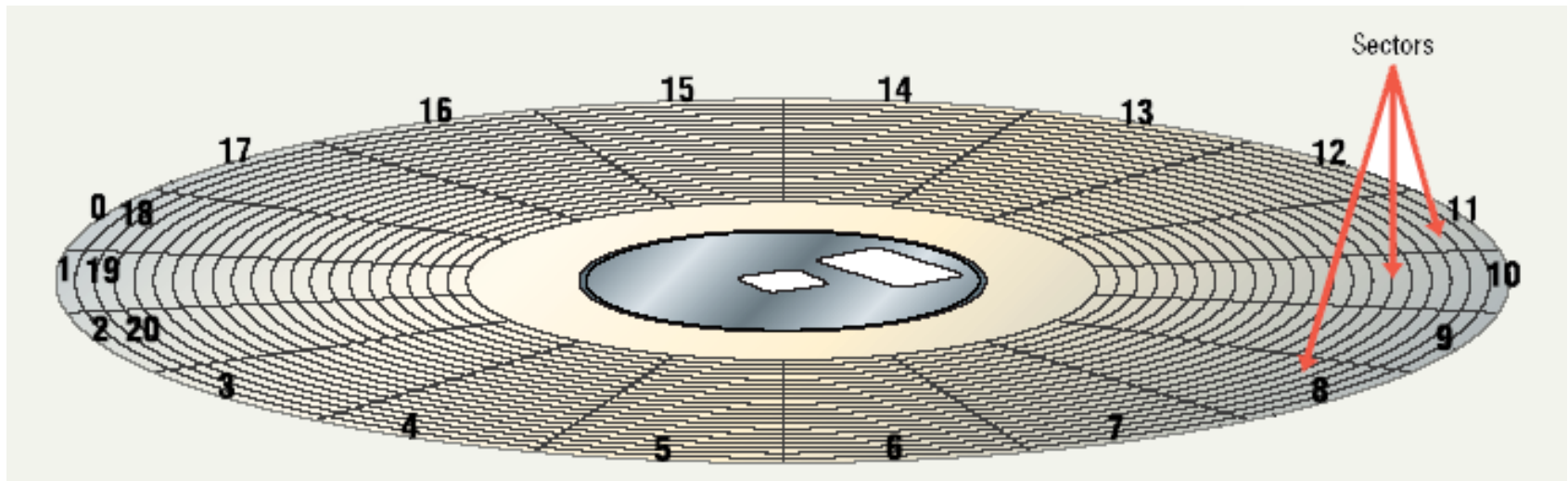




Magnetic Storage Devices (cont.)

➤ Data organization

- ❑ Disks must be formatted before use
 - Mapping disk before use
- ❑ Format draws tracks on the disk
 - Concentric rings
- ❑ Tracks are divided into sectors
 - Amount of data a drive can read
 - Assume 80 tracks on each side, 18 sectors, totals 2880 sectors





Magnetic Storage Devices (cont.)

- Finding data on disk
 - ❑ Each track and sector is labeled (logical formatting)
 - ❑ File system
 - Logical method for storing data on disk surface
 - Listing of where files are stored
 - ❑ File system examples
 - File Allocation Table (FAT)
 - FAT32
 - NTFS
 - ❑ Data is organized in clusters
 - A group of sectors, storage units
 - Size of data the OS can handle as a single unit



Magnetic Storage Devices (cont.)

➤ After FAT format, disk contains four areas

❑ Boot sector

- Program that run on computer startup (booting)
- Control of computer handed over to boot sector after POST

❑ FAT area

- Records status of each sector
- Keep track of allocation status of clusters
- Possible FAT entries for clusters: allocated, unallocated, end of file, bad sector

❑ Root folder

- Folder required for organizing files on disk
- Records location of each file and directory
- Root folder is master folder
- All other folders are subfolders in root folder

❑ Data area

- Kept free for data storage



Magnetic Storage Devices (cont.)

➤ Diskettes

- ❑ Also known as floppy disks
- ❑ Read with a disk drive
- ❑ Recording media of *Mylar*
 - A strong polyester film
- ❑ Spin at 300 RPM
- ❑ Takes .2 second to find data with head
- ❑ 3 ½ floppy disk holds 1.44 MB



➤ Hard disks

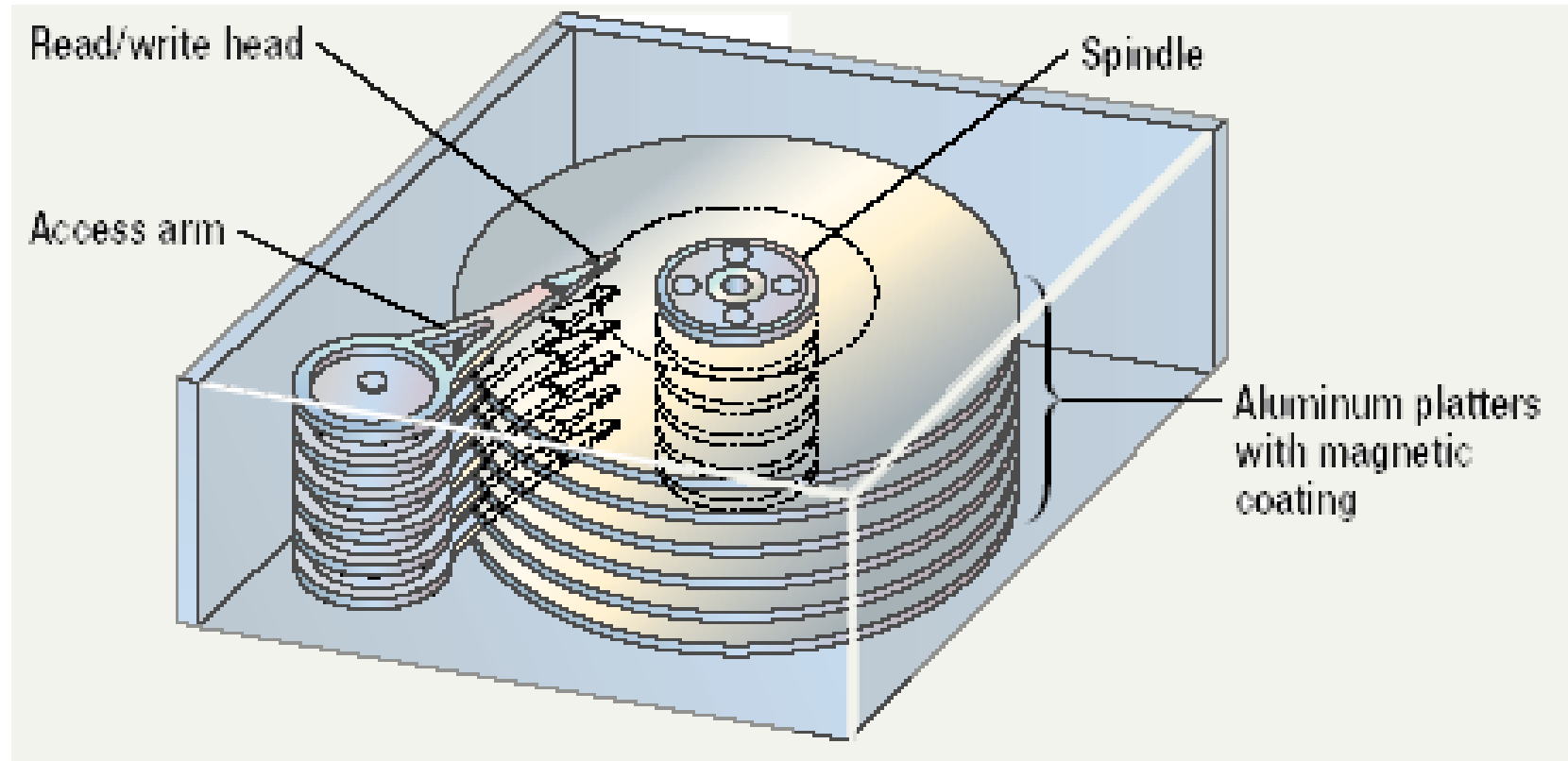
- ❑ Primary storage device in a computer
- ❑ 2 or more aluminium platters
- ❑ Each platter has 2 sides
- ❑ Spin between 5,400 to 15,000 RPM
- ❑ Data found in 9.5 ms or less
- ❑ Drive capacity up to 1 TB

Source: <https://www.amazon.com/Double-Density-MF2-DD-Diskettes-Formatted/dp/B006NNGZ9S>



Magnetic Storage Devices (cont.)

➤ Hard disk illustrated





Magnetic Storage Devices (cont.)

- Removable high capacity disks
 - ❑ Speed of hard disk
 - ❑ Portability of floppy disk
 - ❑ Several variants have emerged
 - ❑ High capacity floppy disk
 - Stores up to 750 MB of data
 - ❑ Hot swappable hard disks
 - Provide up to TB of data space
 - Connect via USB



Magnetic Storage Devices (cont.)

➤ Tape drives

- ❑ Best used for
 - Infrequently accessed data
 - Back-up solutions
- ❑ Slow sequential access
- ❑ Capacity exceeds 200 GB

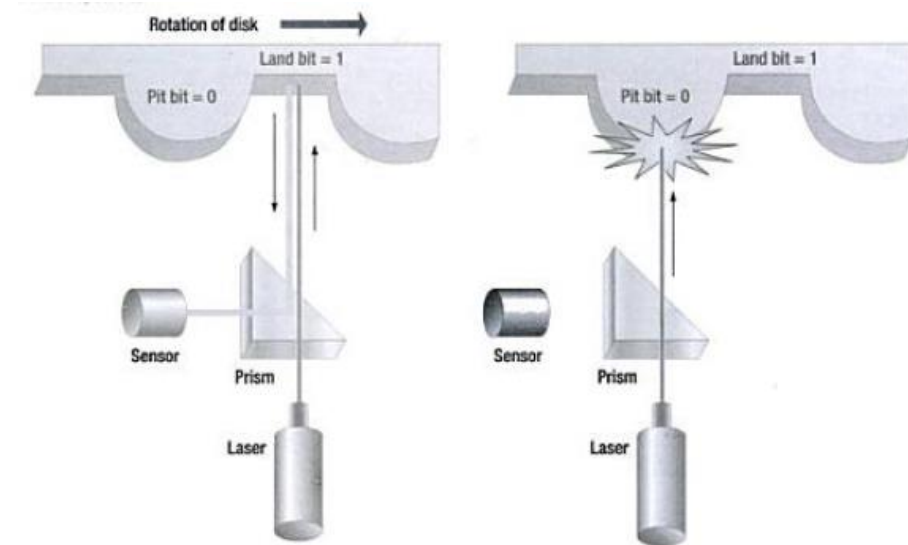




Optical Storage Devices

➤ CD-ROM

- ❑ Most software ships on a CD
- ❑ Read using a laser
 - Lands, binary 1, reflect data
 - Pits, binary 0, scatter data
- ❑ Spiral sectors (all of same width)
- ❑ Written from the inside out
- ❑ CD speed is based on the original
 - Original CD read 150 Kbps
 - A 10 X will read 1,500 Kbps
- ❑ Standard CD holds 650 MB



➤ DVD-ROM

- ❑ Digital Video Disk
- ❑ Use both sides of the disk
- ❑ Capacities can reach 18 GB
- ❑ DVD players can read CDs



Optical Storage Devices (cont.)

- CD Recordable (CD-R)
 - ☐ Create a data or audio CD
 - ☐ Data cannot be changed
 - ☐ Can continue adding until full
- CD ReWritable (CD-RW)
 - ☐ Create a reusable CD
 - ☐ Cannot be read in all CD players
 - ☐ Can reuse about 100 times
- Photo CD
 - ☐ Developed by Kodak
 - ☐ Provides for photo storage
 - ☐ Photos added to CD until full
 - ☐ Original pictures cannot be changed



Optical Storage Devices (cont.)

- DVD Recordable
 - ❑ Several different formats exist
 - ❑ None are standardized
 - ❑ Allows home users to create DVDs
 - ❑ Cannot be read in all players
- DVD-RAM
 - ❑ Allow reusing of DVD media
 - ❑ Erasing possible
 - ❑ Not standardized
 - Cannot be read in all players



Solid State Devices

- Data is stored physically
 - ❑ Using physical switches
- No magnets or laser
- Very fast



Solid State Devices (cont.)

- Flash memory
 - ☐ Found in cameras and USB drives
 - ☐ Combination of RAM and ROM
 - ☐ Long term updateable storage
- Smart cards
 - ☐ Credit cards with a chip
 - ☐ Chip stores data
 - ☐ Eventually may be used for cash
 - ☐ Hotels use for electronic keys
- Solid-state disks
 - ☐ Large amount of SDRAM
 - Not a disk actually, is volatile
 - ☐ For large organizations, for network storage or joint projects
 - Availability of quickly changing data for large number of users at once
 - ☐ Extremely fast
 - ☐ Volatile storage
 - Require battery backups
 - ☐ Most have hard disks copying data for backup