Disk Drive Formats

IBM

Disk Format

- Arrangement of information on disk
- Controls locating, reading and writing of data

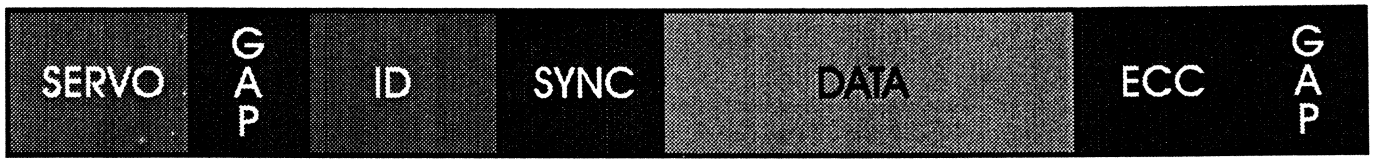
External effects

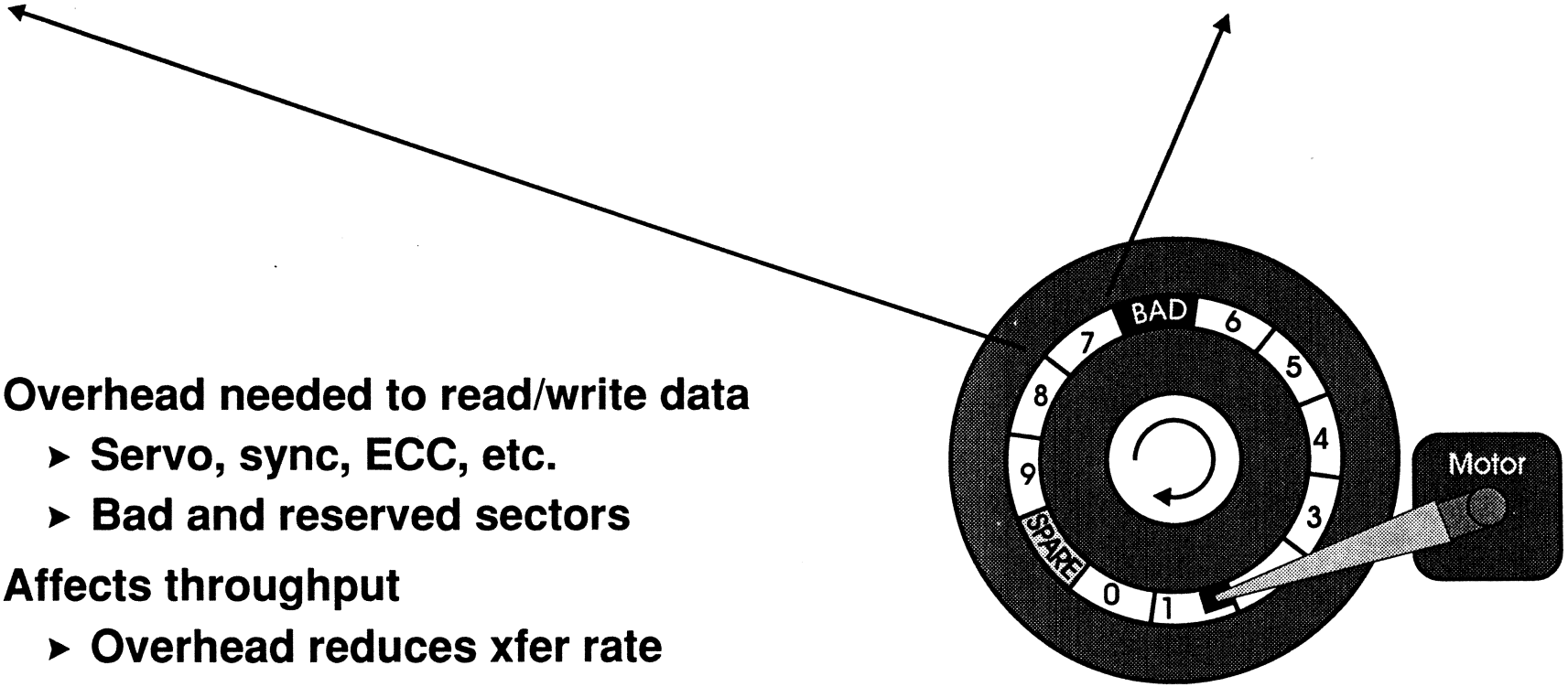
- Capacity
- Performance (throughput)
- Function

Technology focus areas

- Efficiency
- MR head support

Typical Disk Data Format





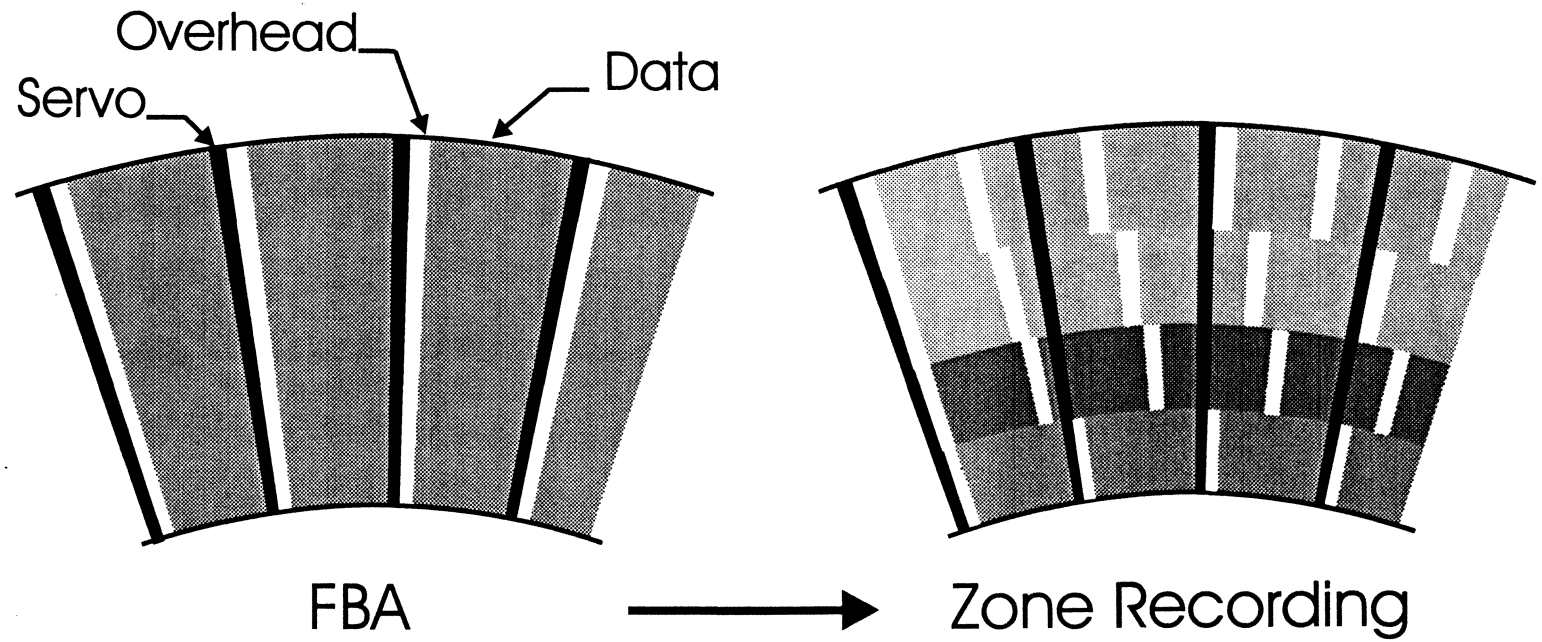
Overhead needed to read/write data

- **Servo, sync, ECC, etc.**
- **Bad and reserved sectors**

Affects throughput

- **Overhead reduces xfer rate**
- **Sectors per track also important**

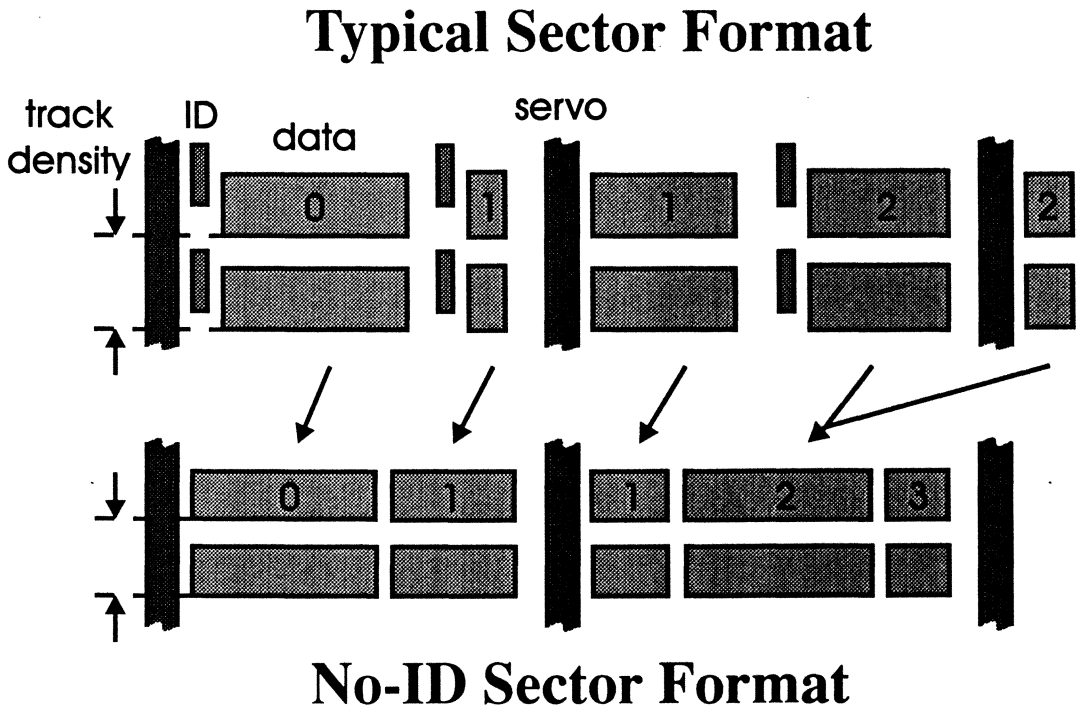
Sector Servo and Zone Recording



Benefits

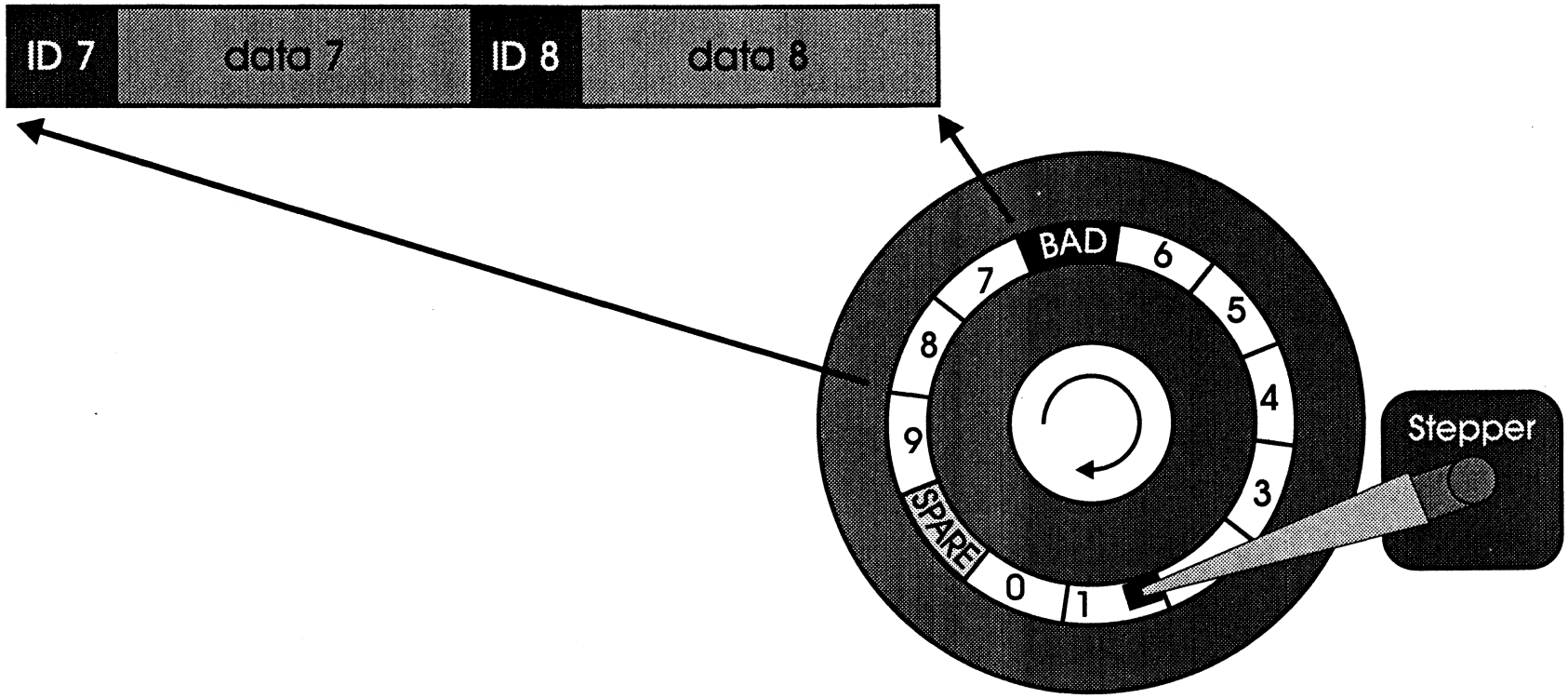
- **Improved areal efficiency**
- **More sectors per track at OD**
- **30% more capacity**
- **Data rate changes**
- **Widely adopted by industry**

IBM No-ID™ Sector Format



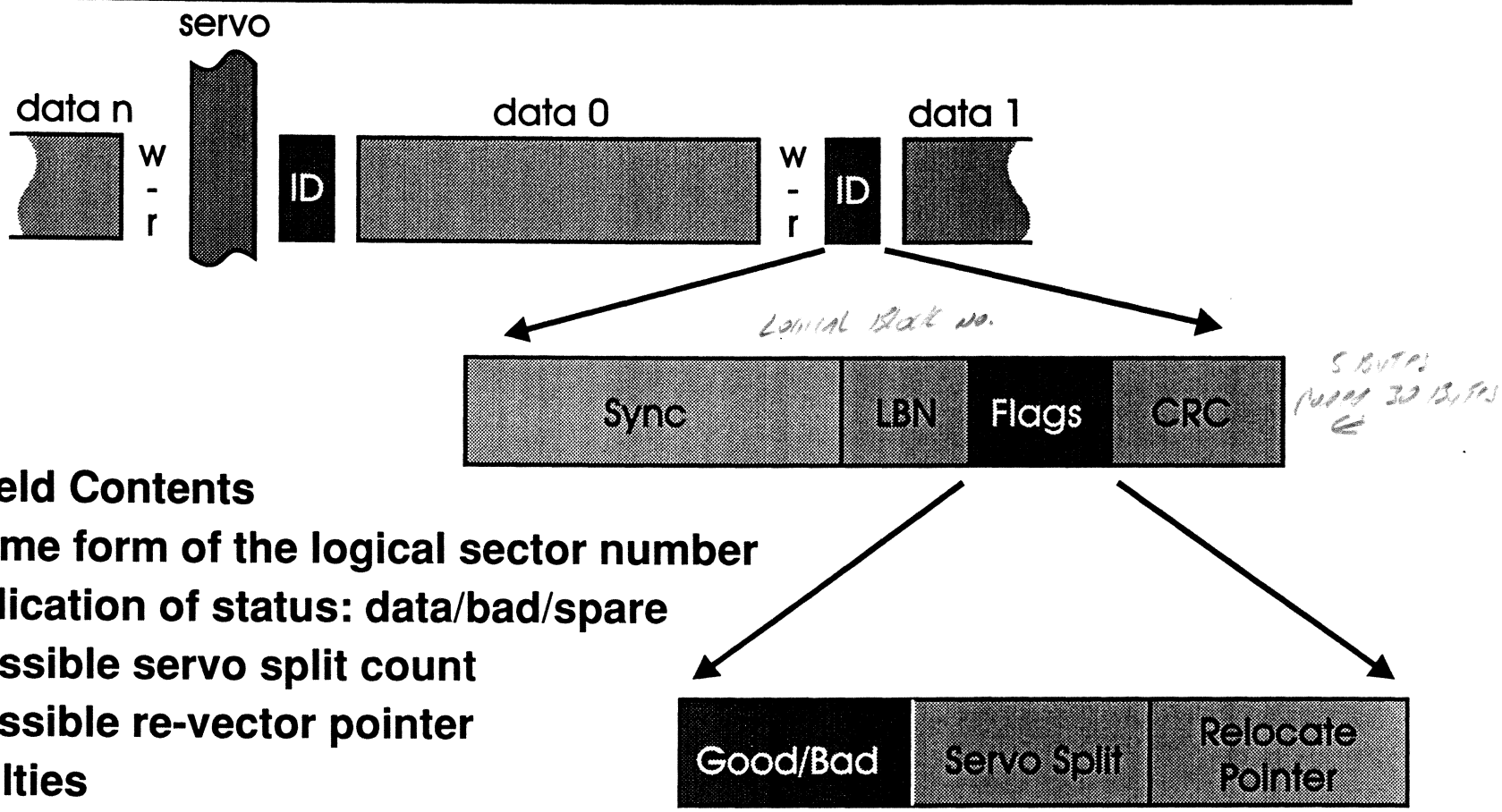
- Remove ID (header) fields
- Improved areal efficiency
- 30% more capacity with MR head IF NO ID Fels
- Improved throughput, defect management
- Industry beginning to adopt

Historical Background for Headers



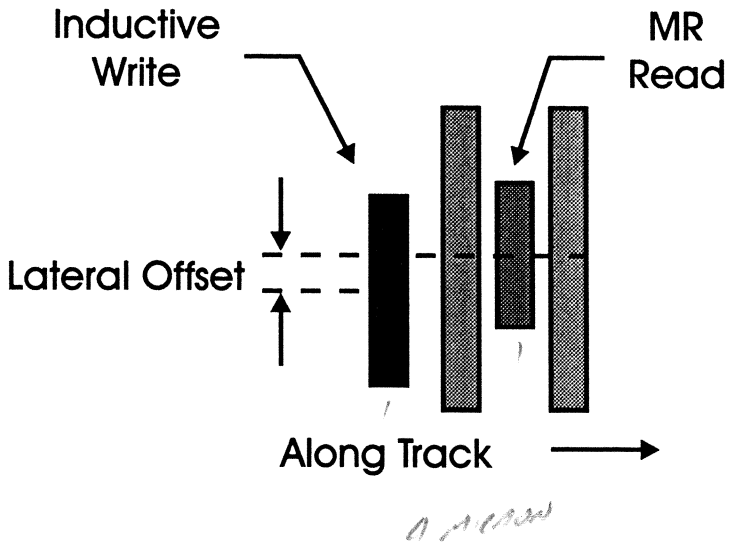
- **Before embedded servo**
  Need verification of data head location prior to read and write
- **Handle defects**
  Allows for local information on defect and spare locations

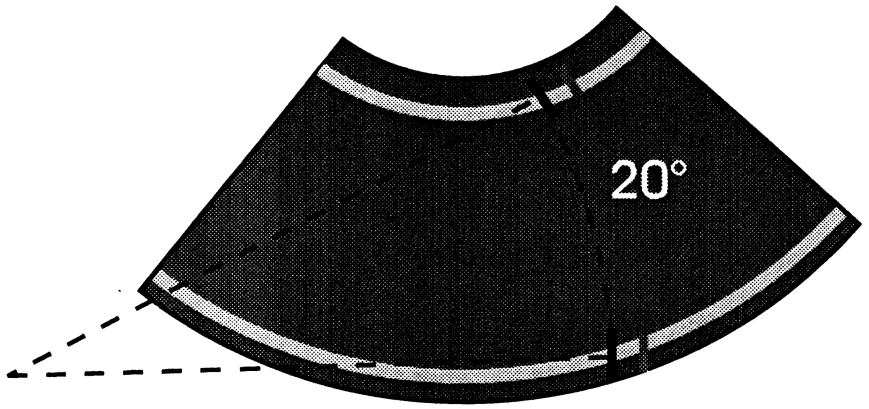
Typical Disk Format With ID Fields



- **ID Field Contents**
  - **Some form of the logical sector number**
  - **Indication of status: data/bad/spare**
  - **Possible servo split count**
  - **Possible re-vector pointer**
- **Penalties**
  - **Only a few bytes of info**
  - **Long sync, expensive to add ECC**
  - **Sparing trades capacity for performance**
  - **Limits TPI with MR head**

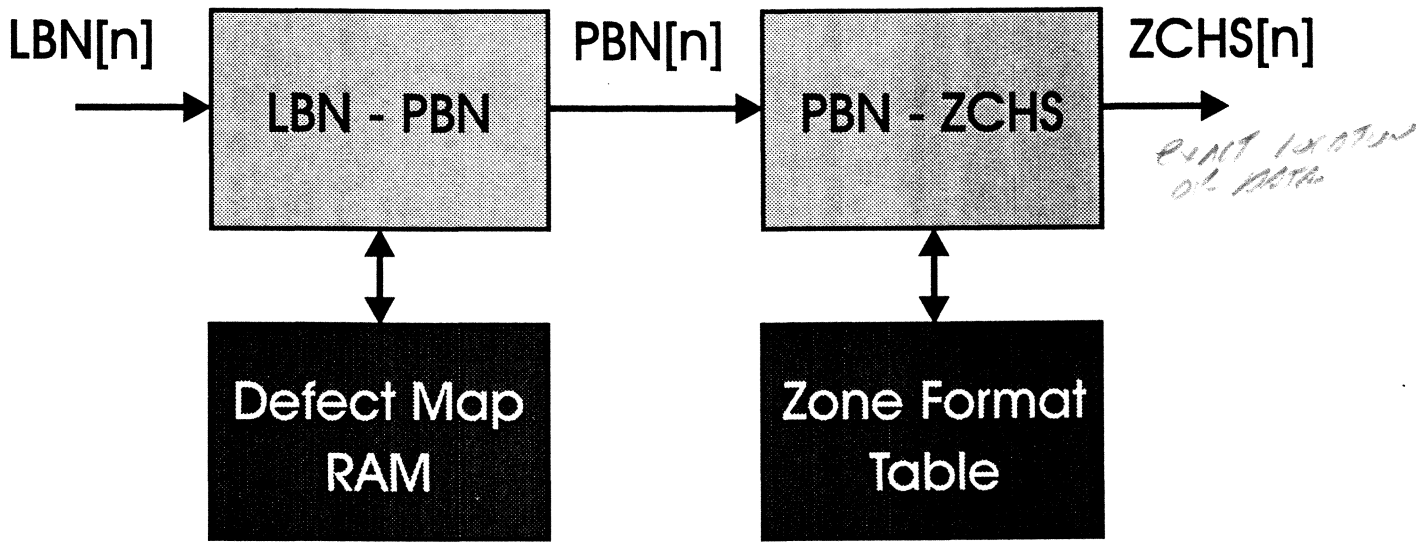
MR Head Geometry





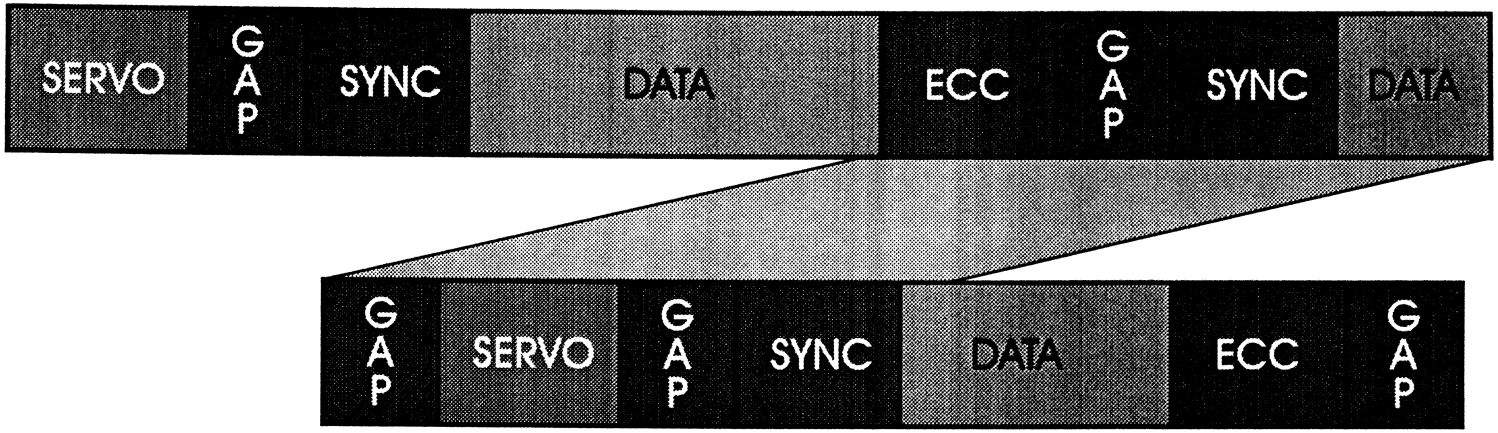
- There is a longitudinal separation of R and W elements
- Rotary actuator typically swings 20°
- This induces skew offset between element centerlines

Sector Identifcation Without Header Information



- Sectors addressed by logical block number [LBN]
- Controller uses defect map to convert to exact ZCHS
- Servo system more robust - locates ZCHS
- Defect map flexible and efficient (very small)
- Minimal info in RAM: defect map plus format data only
- High speed address generation

Future Directions



- Reduce overhead further
  - Still room for improvement
- Add new functions, improve electronics
  - New architectures
  - New applications
- Adaptive Power Management