# Computer based Data Acquisition

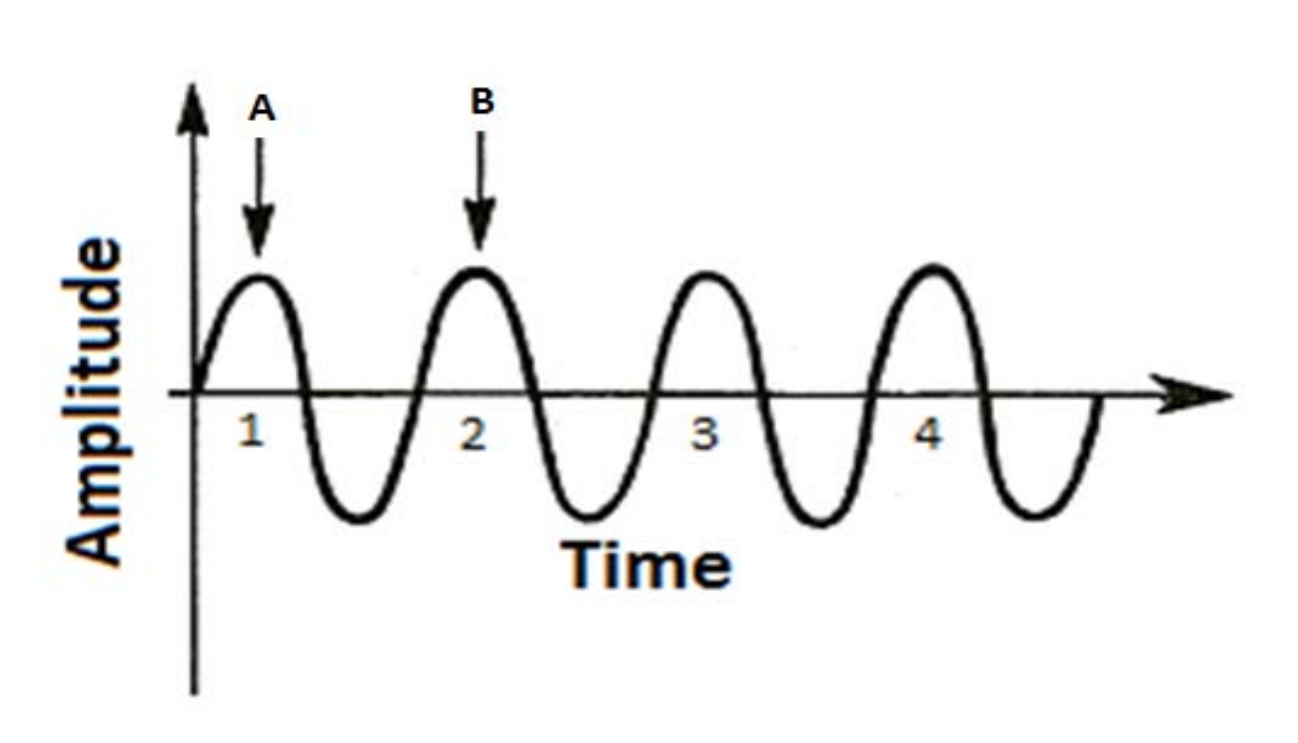
**National Laboratory Immersion Program 2012**

# Need of Computer Data Acquisition

- Allows easy data analysis
- Less errors
- Easy record keeping
- Automation
- Easy way to perform real time adjustments and tuning

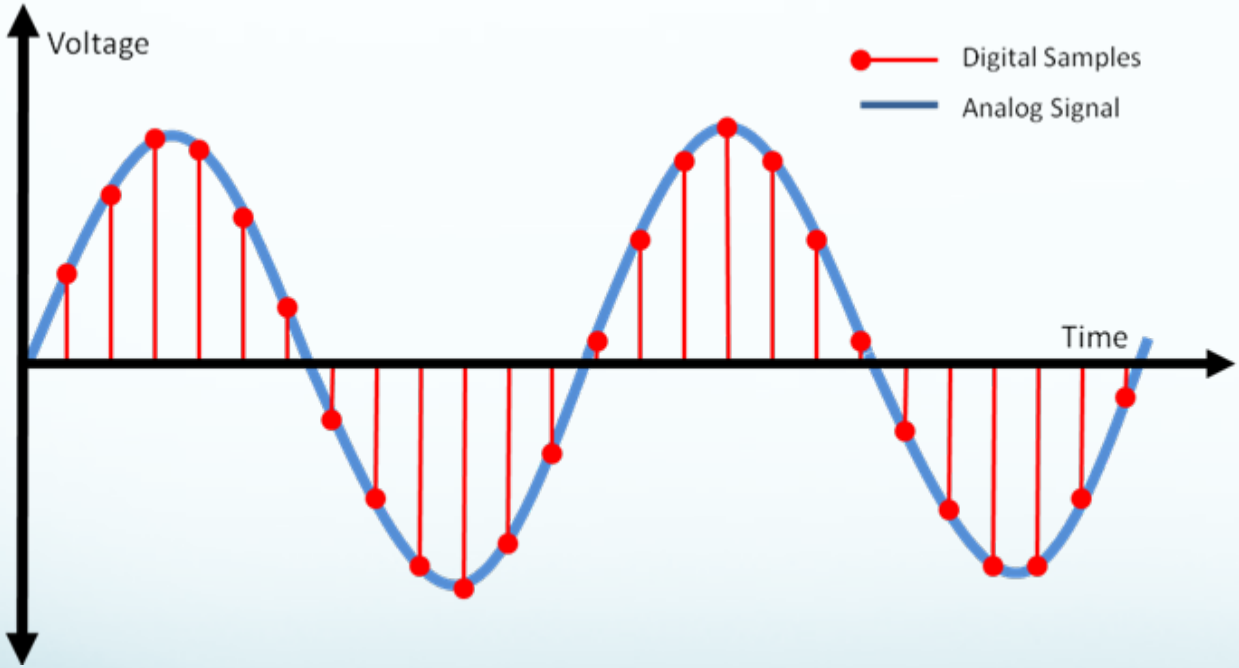
# Data acquisition?

- Continuous time analog signal

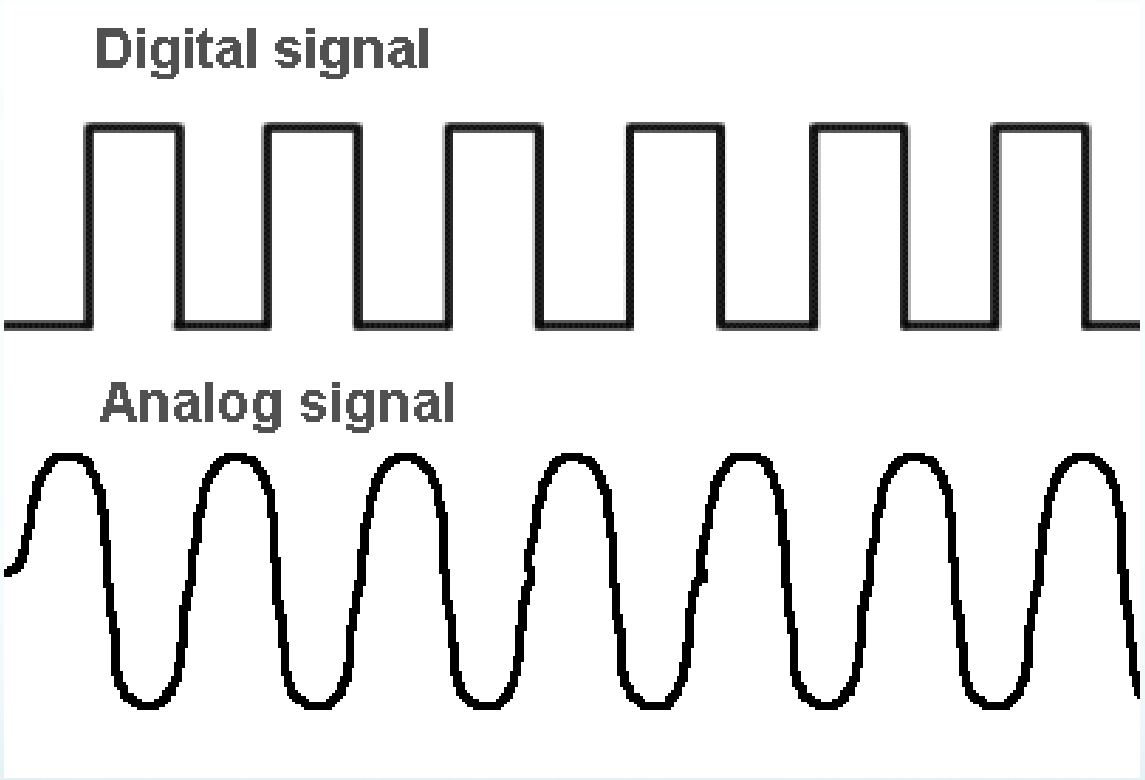


# Data acquisition?

- Discrete time analog signal

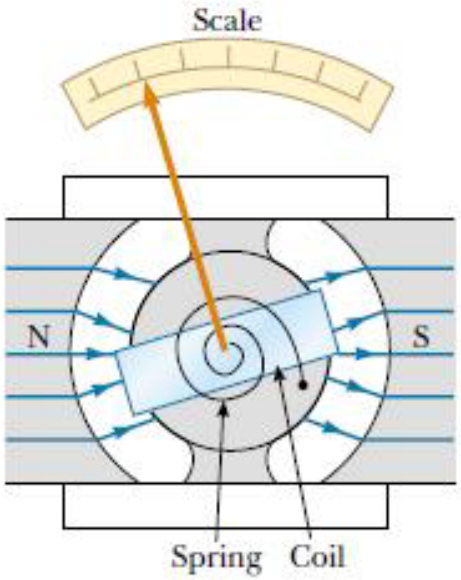


# Data acquisition?



# Data acquisition?

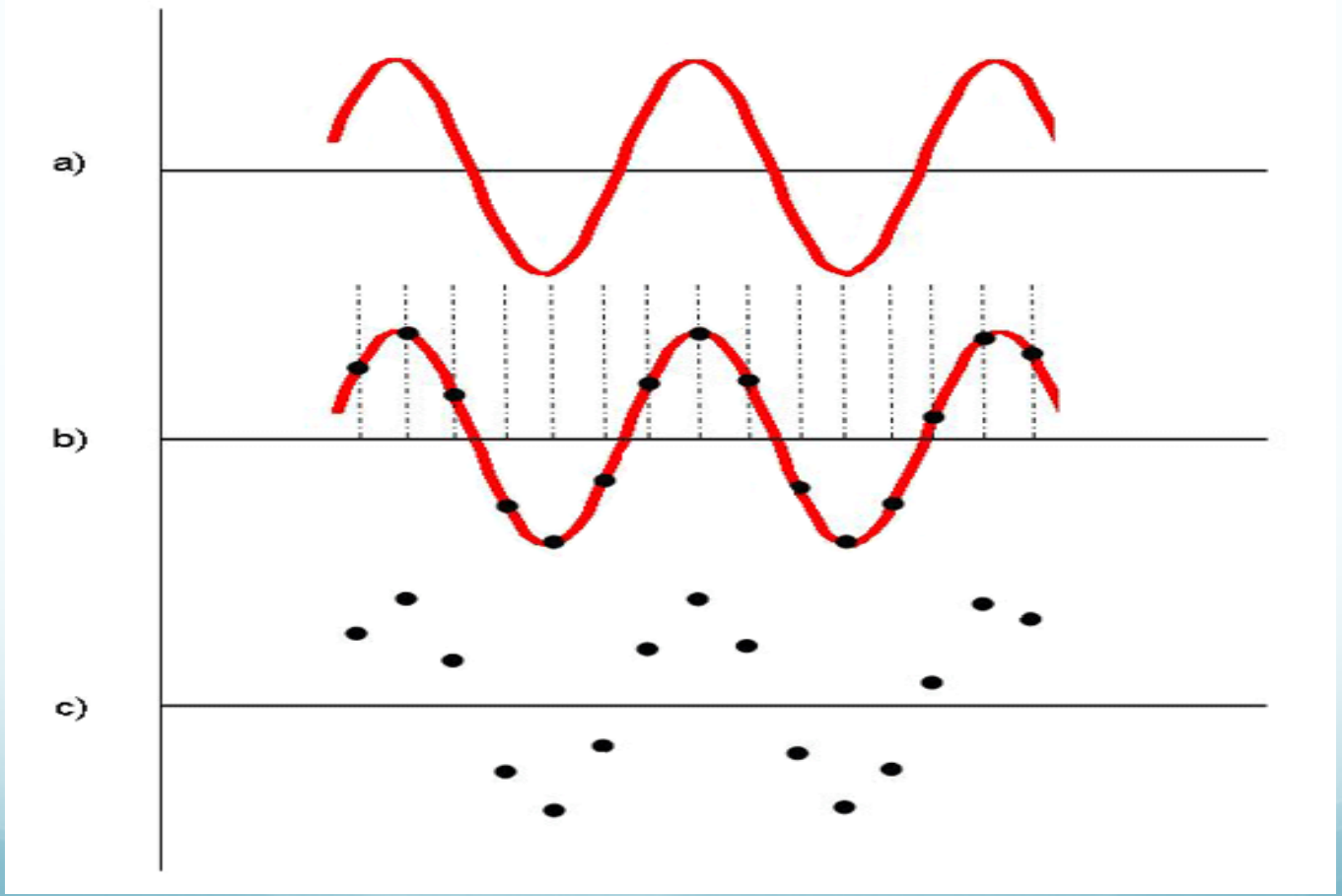
Galvanometer




Digital Volt meter

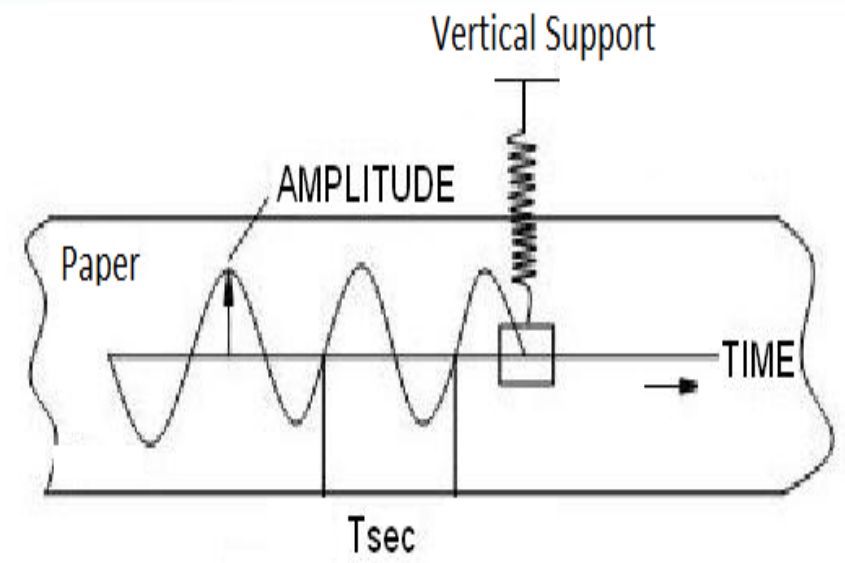
# Data acquisition?

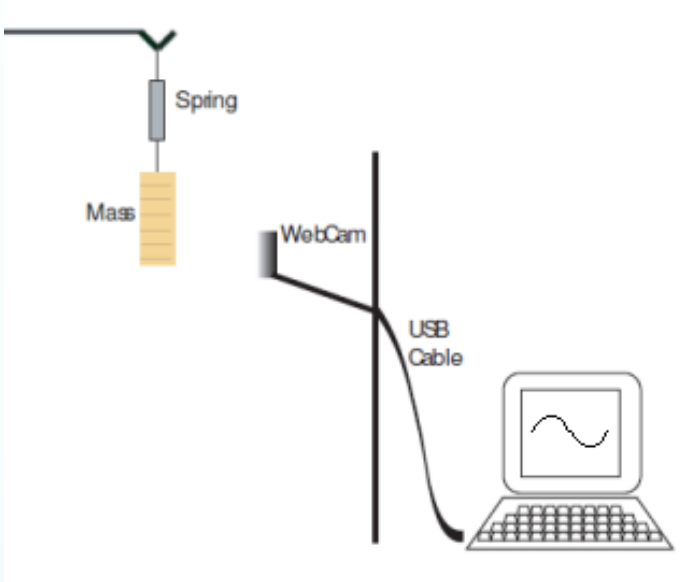
- Sampling



# Analog and Digital methods

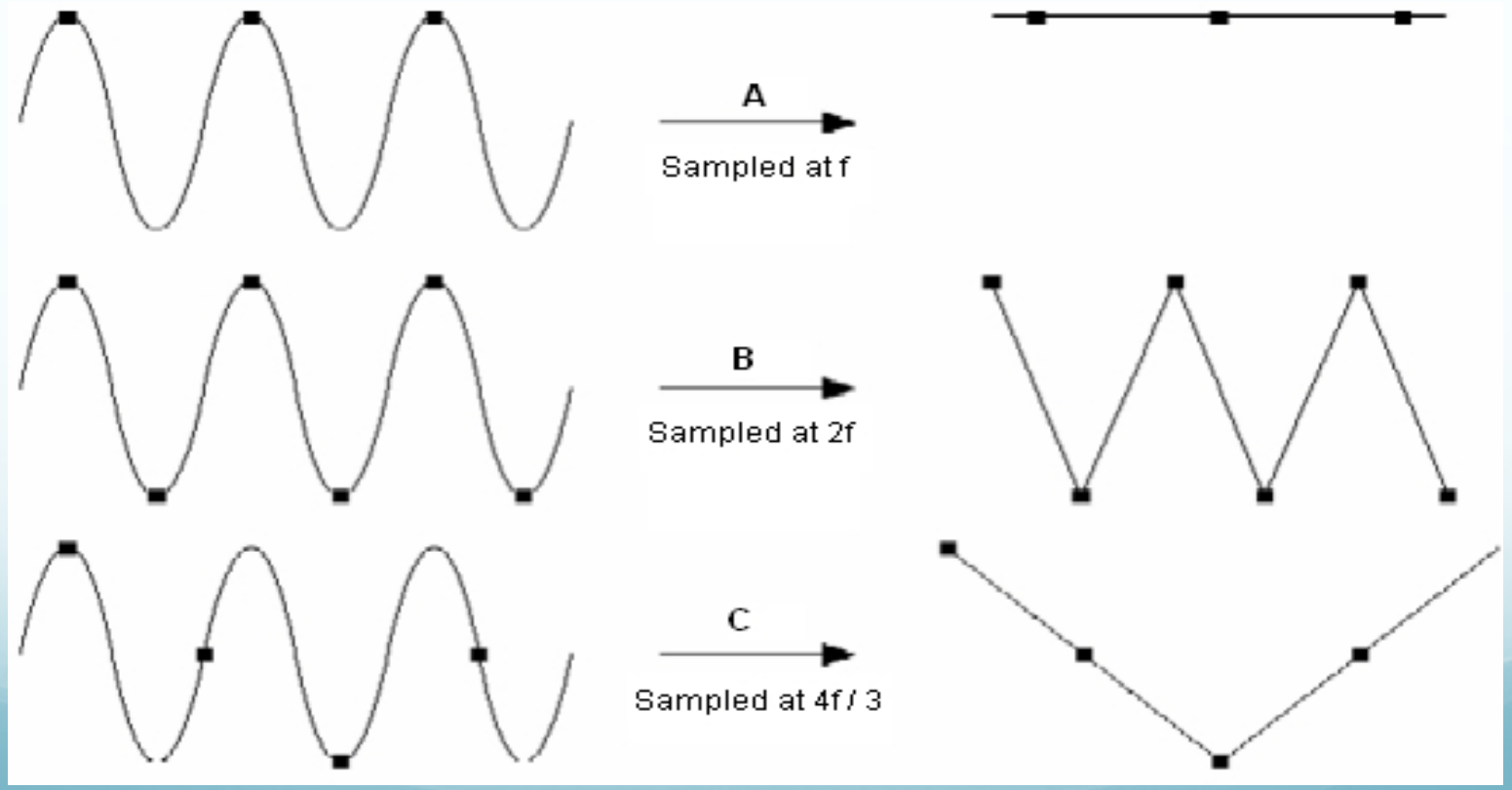
- Simple harmonic motion



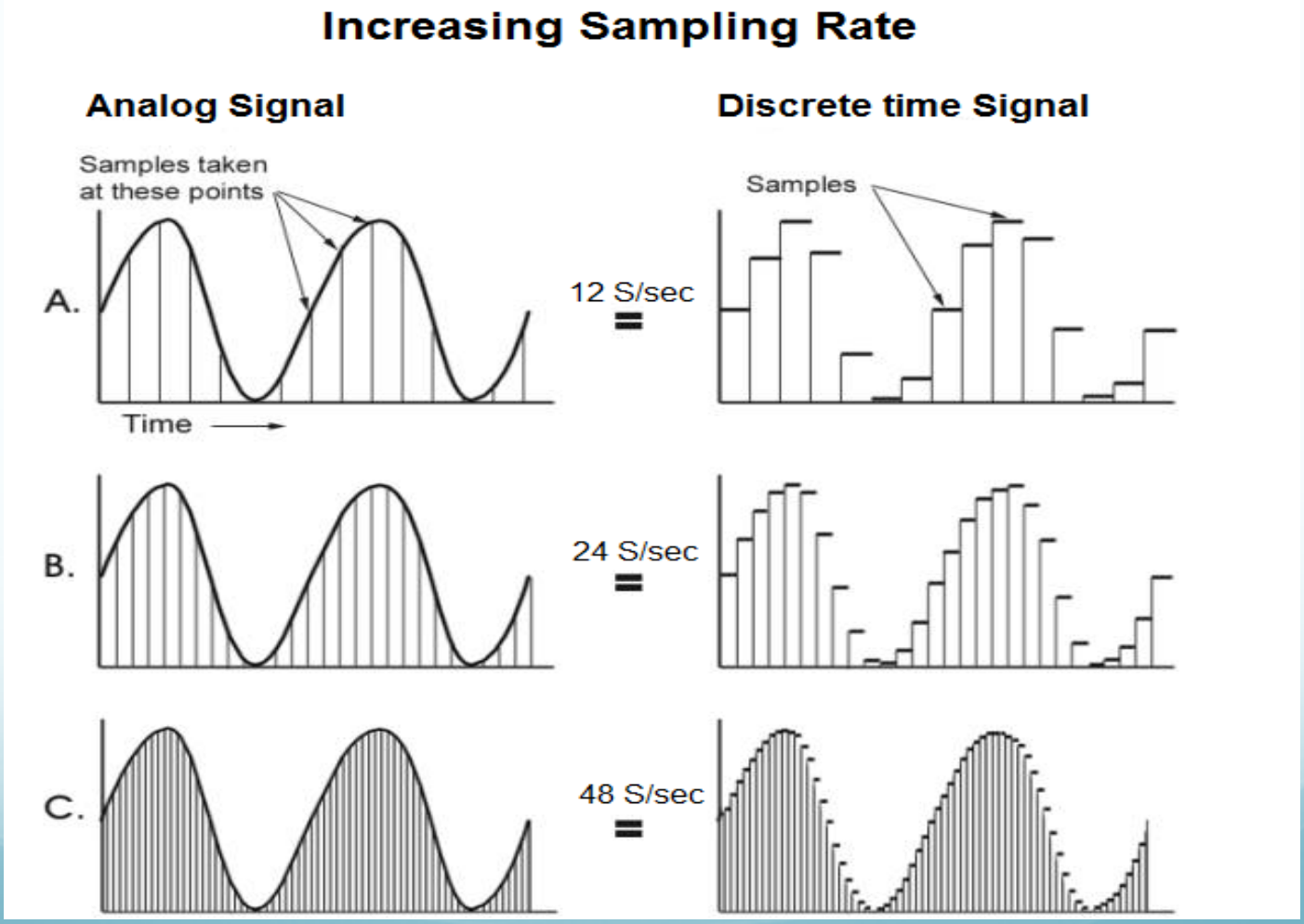
# Sampling Rate

- A: Undersampling
- B: Nyquist criteria - Minimum rate required
- C: Undersampling, Aliasing



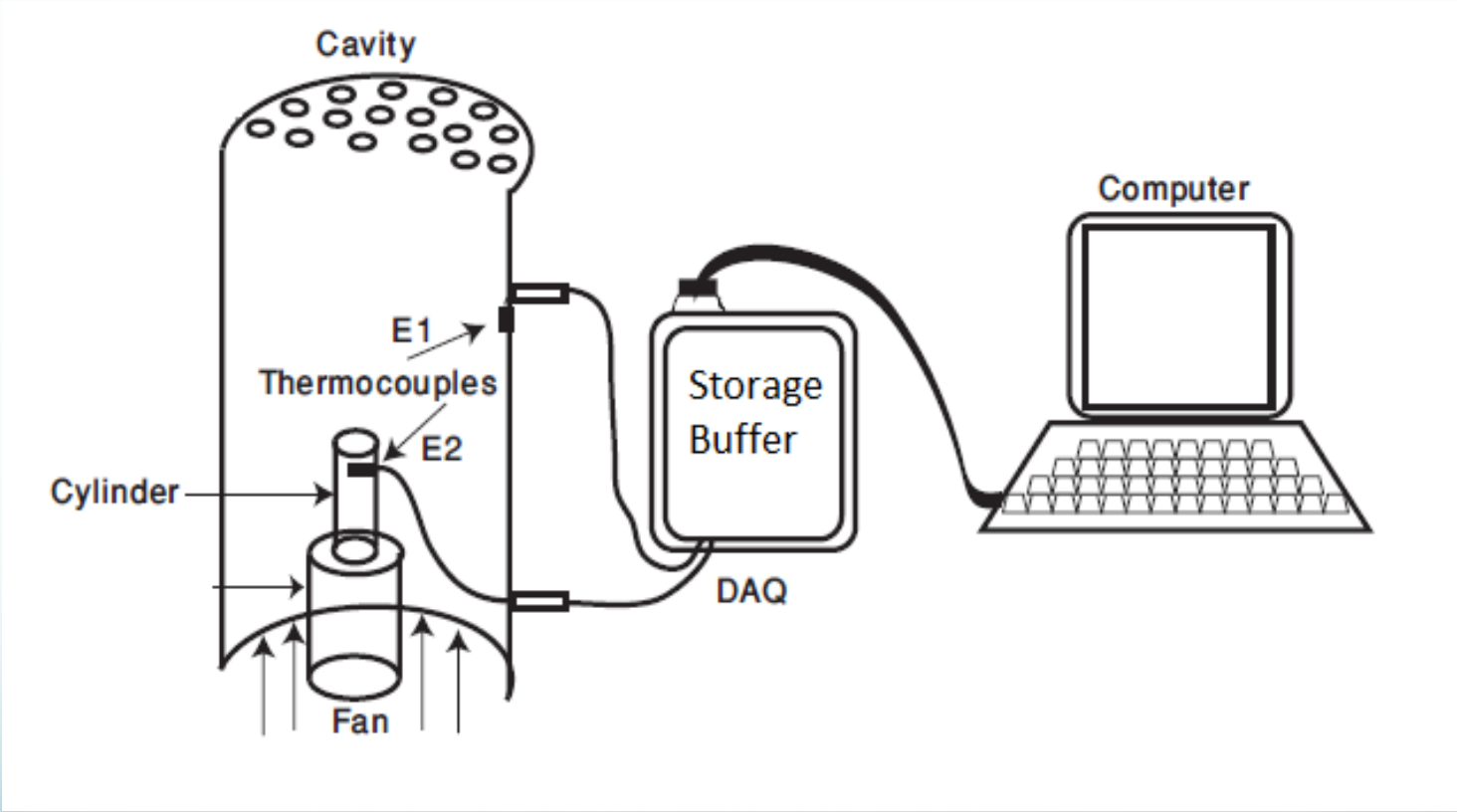
# Sampling Rate

- Signal Reconstruction



# Samples to read

- Samples Storage Buffer:
- Sample rate 1000 → Samples to read 100



# Sampling Resolution

- 3-bit → $2^3$ = 8 → 10/8 = 1.25
- 16-bit → $2^{16}$ = 65536 = 10/65536 = 0.000152587
- 32-bit → $2^{32}$ = 4294967296 = 10/4294967296
  = 2.3 x$10^{-9}$