

Data Acquisition System

Chapter 7

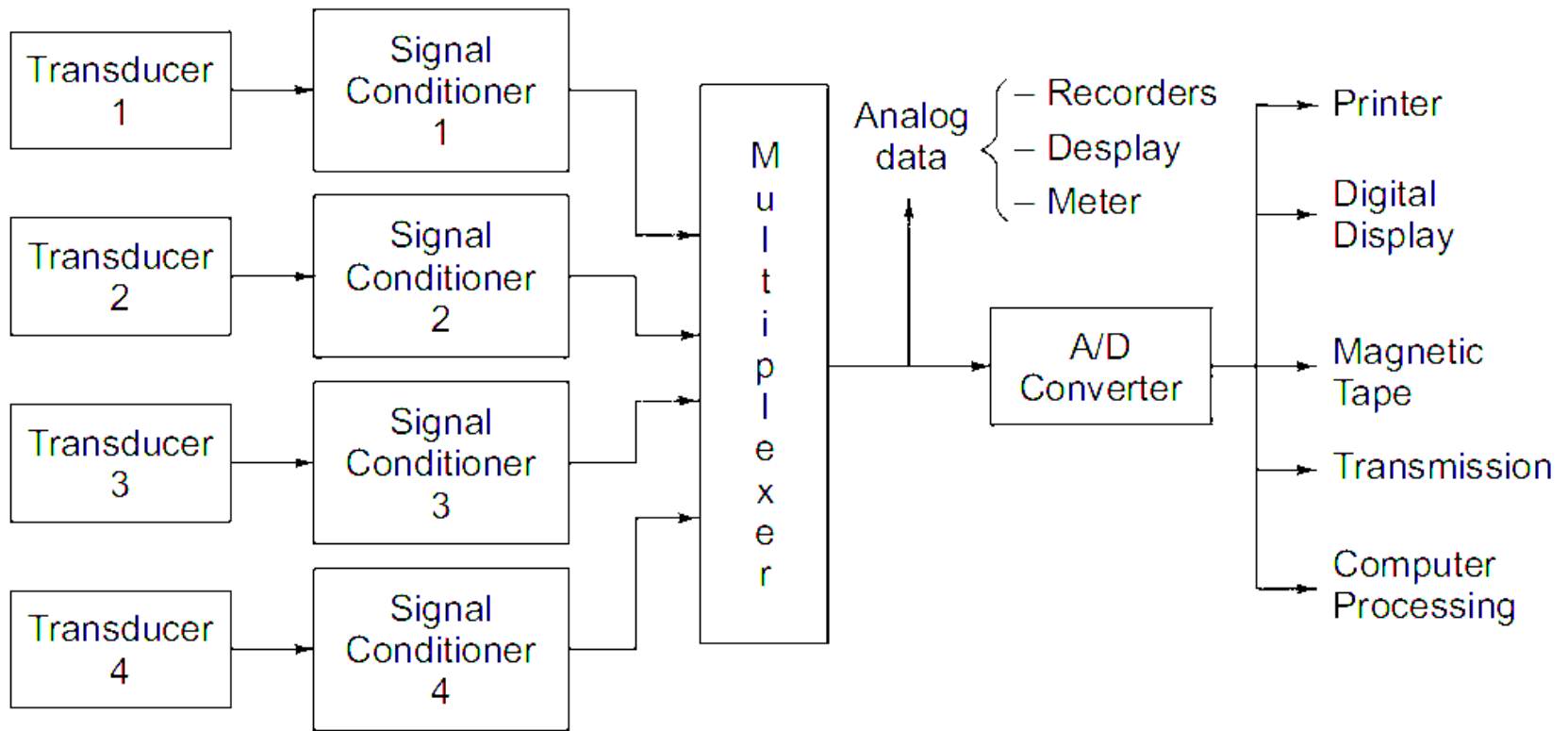
Data Acquisition

- The process of collecting the input information as rapidly, accurately, economically and completely as necessary.
- A typical data acquisition system consists of individual sensors with the necessary signal conditioning, data conversion, data processing, multiplexing, data handling and associated transmission, storage and display systems.

Data Acquisition System

- DAS is used to measure and record signals obtained in basically two ways:
 - Signal originating from direct measurement of electrical quantities which may include DC and AC voltage, frequency or resistance.
 - Signal originating from transducers.

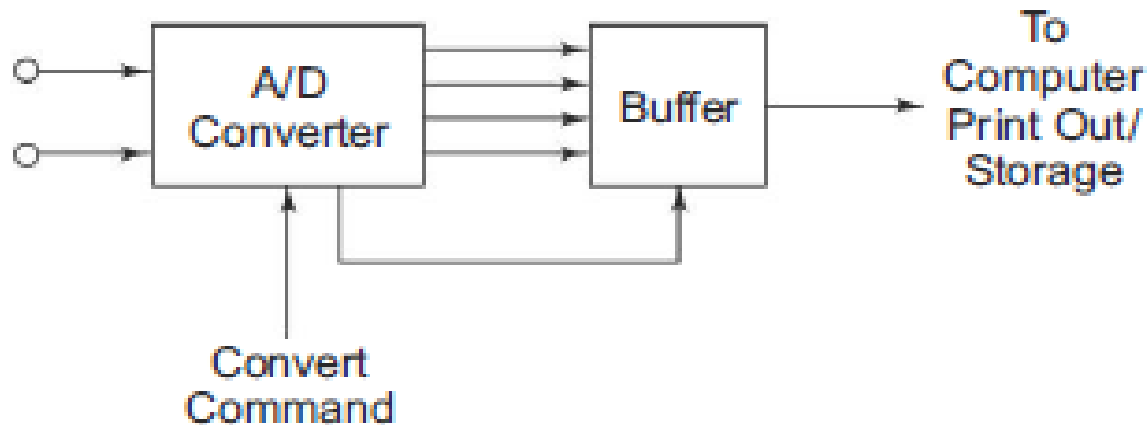
Data Acquisition System



Configuration of DAS

- Factors affecting the configuration of DAS:
 - Resolution and accuracy
 - Number of channels to be monitored.
 - Sampling rate per channel.
 - Signal conditioner requirement per channel.
 - Cost.
- Two configurations:
 - Single channel DAS
 - Multi channel DAS

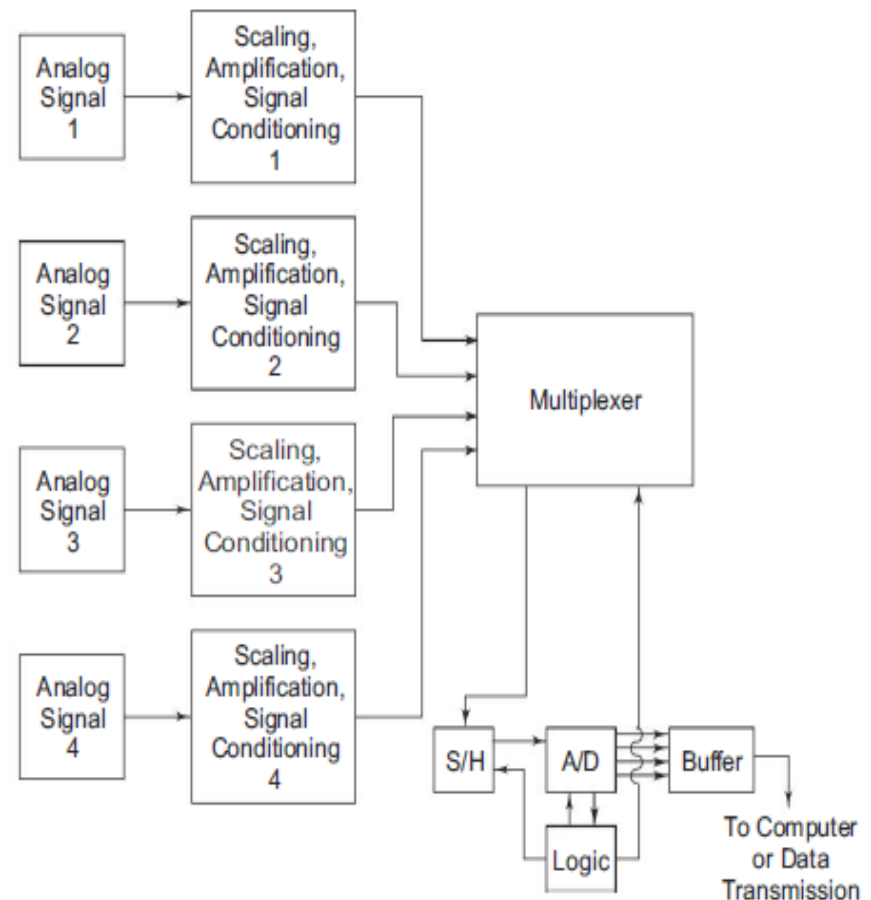
Single Channel DAS



- It consists of signal conditioner followed by ADC.
- Eg: Digital Panel Meter (DPM)
- It is slow and BCD o/p must be converted to Binary if processed by digital equipments.

Multi Channel DAS

- Individual analog signal applied to MUX thru signal conditioner.
- Converted to digital form by ADC sequentially.
- To make it more faster, the multiplexer takes the i/p thru next channel while the previous data stored in sample and hold ckt is converted into digital.
- When conversion completed, S/H ckt returns to sample mode and acquires the signal of next channel.

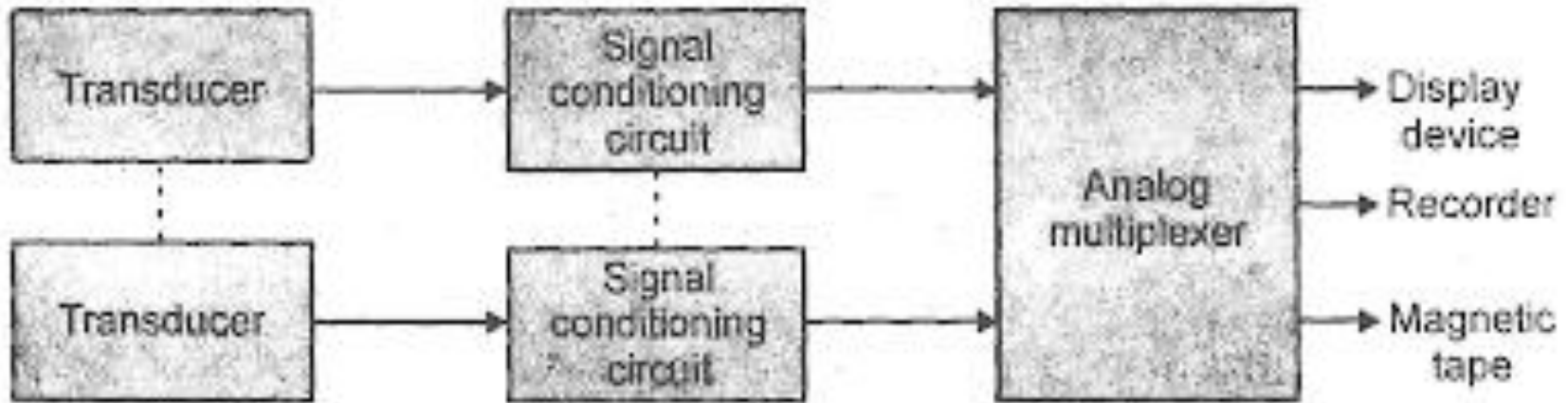


Data Acquisition System

- As instrument may be either analog or digital systems, correspondingly we have two types of DAS:
 - Analog Data Acquisition System
 - Digital Data Acquisition System

Analog DAS

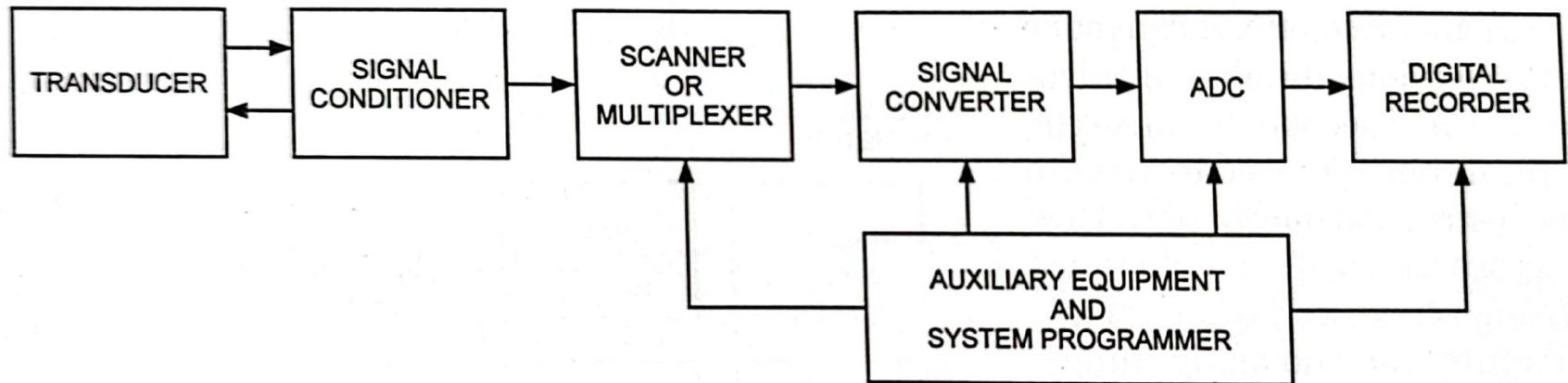
- The block diagram of analog DAS:



- Components: Transducer, Signal Conditioner, Analog Multiplexer and Analog Recorders.

Digital DAS

- The block diagram of digital DAS is :



Digital DAS

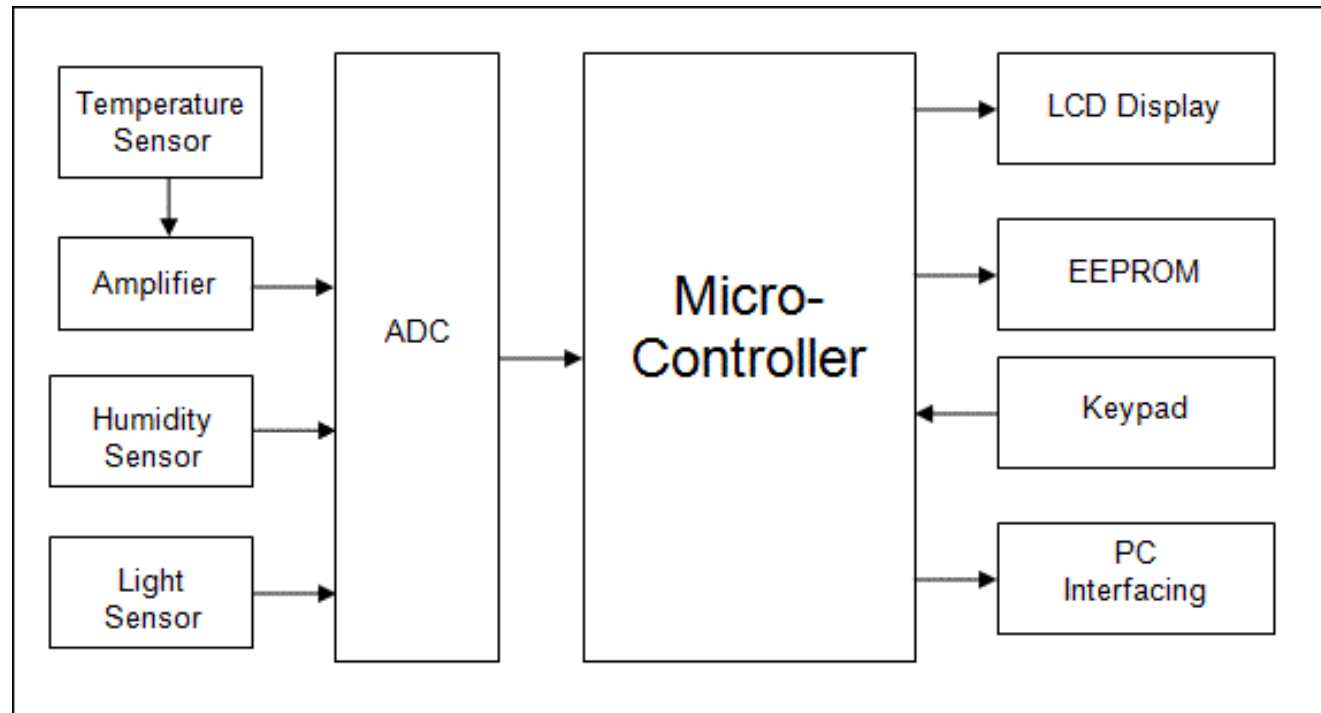
- Mainly, the following **operations** take place in digital data acquisition.
 - Acquisition of analog signals.
 - Conversion of analog signals into digital signals or digital data.
 - Processing of digital signals or digital data.
- Components:
 - Transducer, signal conditioner, MUX, ADC, digital recorder.

Applications of DAS

- Biomedical, aerospace, telemetry.
- Analog DAS is used when wide bandwidth is required or when lower accuracy can be tolerated.
- Digital DAS is used when there is narrow bandwidth, high accuracy and low per channel cost is required.
- The complexity of digital DAS range from single channel DC voltage measuring and recording to automatic multi channel system which measures a large parameters, compare them and provide decision.
- Digital DAS is more complex than analog DAS in both instruments involved and volume and complexity of i/p data they can handle.

Modern trends in DAS

- Microcontroller based DAS



Modern trends in DAS

- PC based DAS:

