

5.9 DATA ACQUISITION SYSTEMS

Data acquisition is the process of real-world physical conditions and conversion of the resulting samples into digital numeric values that can be manipulated by a computer. Data acquisition and data acquisition systems (abbreviated with the acronym **DAS**) typically involves the conversion of analog waveforms into digital values for processing.

The components of data acquisition systems include:

- i) Sensors that convert physical parameters to electrical signals.
- ii) Signal conditioning circuitry to convert sensor signals into a form that can be converted to digital values.
- iii) Analog-to-digital converters, which convert conditioned sensor signals to digital values.

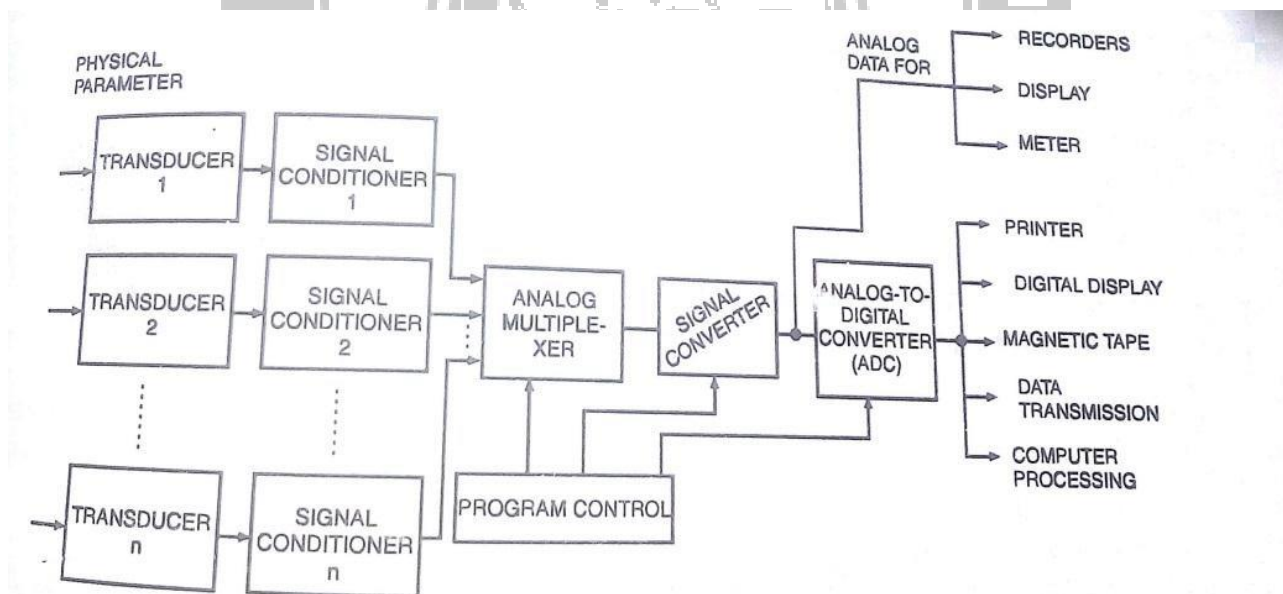


Fig 5.9.1 Fundamental elements of data acquisition system

- Data acquisition is the process of extracting, transforming, and transporting data from the source systems and external data sources to the data processing system to be displayed, analyzed, and stored.
- A data acquisition system (DAQ) typically consist of transducers for asserting and measuring electrical signals, signal conditioning logic to

perform amplification, isolation, and filtering, and other hardware for receiving analog signals and providing them to a processing system, such as a personal computer.

- Data acquisition systems are used to perform a variety of functions, including laboratory research, process monitoring and control, data logging, analytical chemistry, tests and analysis of physical phenomena, and control of mechanical or electrical machinery.
- Data recorders are used in a wide variety of applications for imprinting various types of forms, and documents.
- Data collection systems or data loggers generally include memory chips or strip charts for electronic recording, probes or sensors which measure product environmental parameters and are connected to the data logger.
- Hand-held portable data collection systems permit in field data collection for up-to-date information processing.
- Data acquisition begins with the physical phenomenon or physical property to be measured.
- Examples of this include temperature, light intensity, gas pressure, fluid flow, and force. Regardless of the type of physical property to be measured, the physical state that is to be measured must first be transformed into a unified form that can be sampled by a data acquisition system.
- The task of performing such transformations falls on devices called sensors.
- The ability of a data acquisition system to measure differing properties

depends on having sensors that are suited to detect the various properties to be measured. There are specific sensors for many different applications.

- DAQ systems also employ various signal conditioning techniques to adequately modify various different electrical signals into voltage that can then be digitized using an Analog-to-digital converter (ADC).
- The signal may need to be amplified, filtered or demodulated.
- Various other examples of signal conditioning might be bridge completion, providing current or voltage excitation to the sensor, isolation, and linearization. For transmission purposes, single ended analog signals, which are more susceptible to noise can be converted to differential signals. Once digitized, the signal can be encoded to reduce and correct transmission errors.

