

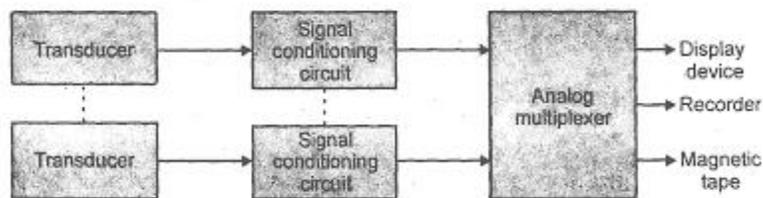
SIGNAL CONDITIONING CIRCUITS: DATA ACQUISITION SYSTEMS

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 systems are used to measure and record signals obtained in two ways. They are

- i) Signals originating from direct measurement of electrical quantities (DC and AC voltage, frequency etc.,)
- ii) Signals originating from transducers (Strain gauges, thermocouple etc.,)

Generally, the instrumentation systems can be classified into analog systems and digital system Analog systems deal with measurement information in analog form. An signal may be defined as a continuous function, such as a plot of voltage versus time, or displacement versus pressure. A digital quantity may consist of a number of discrete and discontinuous pulses whose time relationship contains information about the magnitude or the nature of the quantity.



Block diagram of an analog data acquisition system

It consists of transducers, signal conditioners multiplexer and output devices such as display, recorder and magnetic tape. Transducers are used for translating physical parameters into electrical signals. The Output of the transducer is to signal conditioning circuit where the signal is amplified and modified to the required level. The analog multiplexer selects of the several input signals (transducer signal) and the output he multiplexer is given to a display device or a recorder or a magnetic tape.

The characteristics of the Data Acquisition System (DAS) depend on both the properties of the analog data and the processing carried out. Based on the environment, the DAS is classified into types as those suitable for favorable environments (minimum interference and electromagnetic induction) and those intended for hostile environments.

The DASs are designed based on the following factors.

1. Accuracy and resolution
2. Number of channels to be monitored
3. Analog or digital signal
4. Single channel or multichannel
5. Sampling rate per channel
6. Signal conditioning require of each channel
7. Cost

Objectives of a DAS

1. It must acquire the necessary data at correct speed and at the correct time.
2. It must use all the data's efficiently to inform the operator about the state of the plant.
3. It must monitor the complete plant operation to maintain on-line optimum and safe operations
4. It must provide an effective human communication system and be able to identify problem areas,
thereby minimizing unit availability and maximizing unit through point at minimum cost.
5. It must be able to collect summaries and store data for diagnosis of operation and record purpose
6. It must be able to compute unit performance indices using on-line, real-time data.
7. It must be flexible and capable of being expanded for future Requirements.
8. It n be reliable and not have a down time greater than 0.1%.

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