Unit - 5

Data Transmission :-

Notes:- University Question (VI Long Study)

In modern measurement system, the various component comprising the system are usually located at a distance from each other. It is therefore become necessary to Transmit the data or information betⁿ them through some Form of communication channel. The Transmi-ssion of measured variable to a remote point is an important function in the instrumentation system.

The diffⁿ Transmission schemes are given belows.

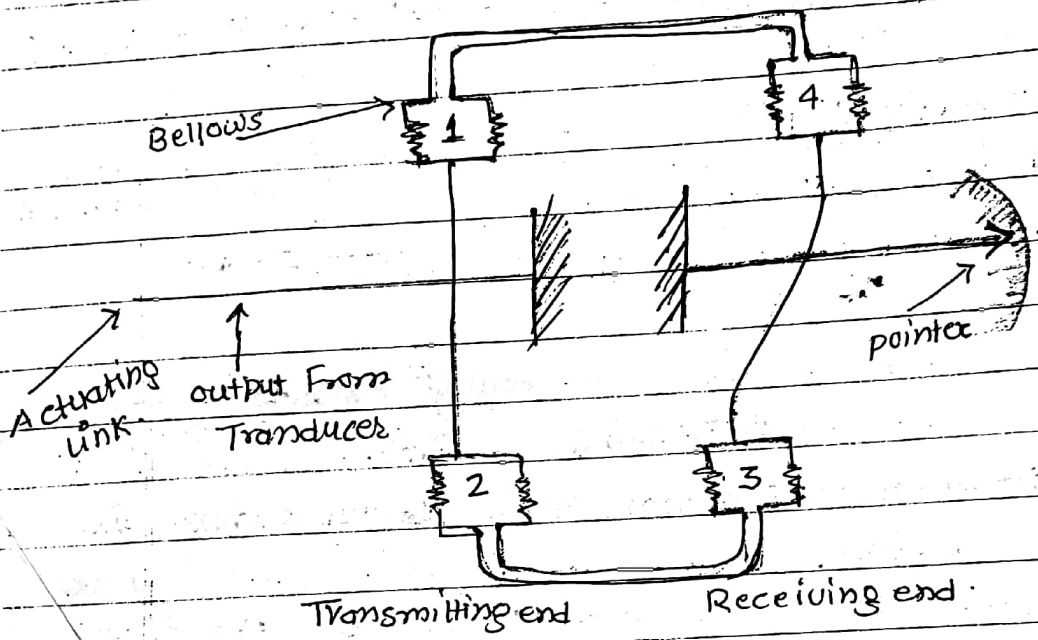
1. Hydraulic Transmission.
2. Pneumatic Transmission.
3. Electrical & Electronics Transmission.

1. **Hydraulic Transmission :-** Hydraulic Transmission methods are employed for Transmission over a short distance.
2. **Pneumatic Transmission :-** Pneumatic Transmission devices are generally used up to maxᵐ distance of 200 m.
3. **Electrical & Electronics Transmission :-** Electrical & Electronics Transmission are suitable equally for short as well as long distance Transmission.

→ Generally, short Transmission is carried out on own communication connections betⁿ sending and receiving devices.

→ The telemeters which are designed For Long-dist-ance Transmission may be designed to Transmi-ssion over their own wire or over phone wires or by microwave.

① Hydraulic Transmission :- Hydraulic method of Transmission is used commonly, in this Transmission, Four bellows are used, Two at the receiving end and Two at the Transmission end. The total Four bellows connected in pipeline and which are filled with liquid. The Hydraulic Transmission fig-④ given below.

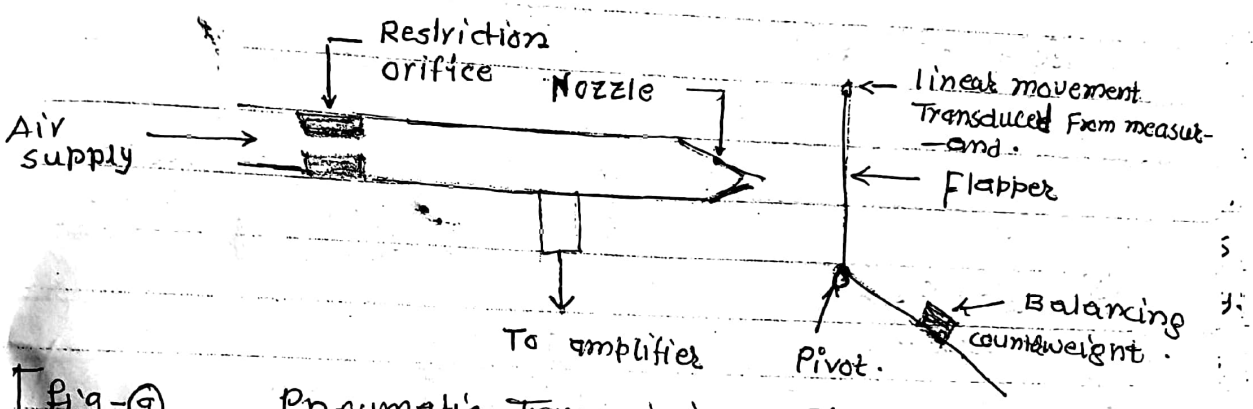


[fig-④ Hydraulic Method of Transmission]

When the actuating link, on the Transmission end, is operated by the measurand, then bellows is expanded and other is contracted. This expansion and contraction is communicated to receiving end, which move the receiving pointer an equal amount. the purpose of using two bellows on either side is to compensate for changes in ambient temp.

(2) Pneumatic Transmission :-

It is consists of an open nozzle which is supply with air through a restriction / orifice [diameter being smaller than nozzle diameter for proper functioning]. In Front of the nozzle, there is a flapper which is positioned by measuring element. The force on the flapper is produced by a Transducer which converts the measurand into linear displacement. The flapper is pivoted about a point and the other end, it contains some balancing counter weight.

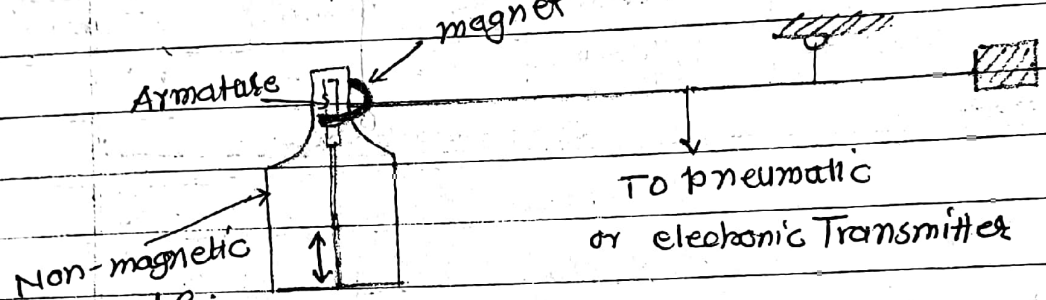


[Fig-④ Pneumatic Transmission - Flapper nozzle mechanism]

When the flapper is moved against, the nozzle, The air cannot escape and max^m air passes to a amplifier, and when flapper is moved away from the nozzle, min^m air passes to the amplifier as most of the air escapes to atmosphere. Thus, the movement of flapper from one extreme position to another serves to control the amplifier, which produced an air pressure proportional to the measurand of adequate (fully sufficient required) strength. For Transmission over the required distance.

(3) Magnetic Transmission [Electronics Transmitter] -

In this arrangement or device, the armature is attached at the end of the mechanical moving part whose movement is to be transmitted outside the armature moving inside a non-magnetic tube. A magnet is placed around the armature outside the tube. The magnet follows the movement of the armature and repositions a pneumatic Transmitter. The magnet movement could also be utilised to operate an electronics Transmitter the fig-④ given belows.



[fig-④ Electronics Transmission]

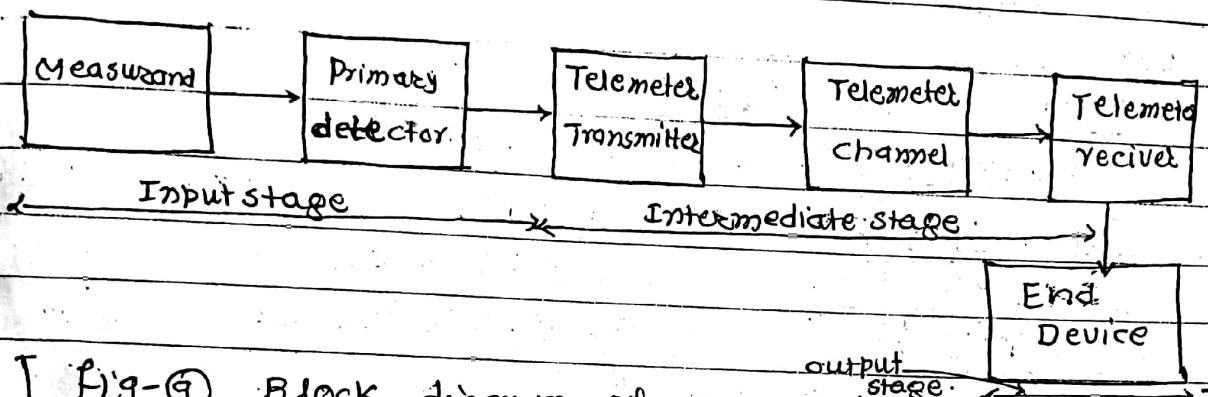
④ Electric Types of Transmitters :-

Most of the electric Transmitters employ A.C. bridge ckt in which degree of coupling betn inductances is varied by changing the amount of iron core within a coil. example:

① Indutance bridge.
② Impedance bridge.
③ Wheatstone bridge.
④ self-syn motor.

Telemetry :- Telemetry means measuring at a distance. In other words, which allows users to collect information from inaccessible and inconveni - ent locations and to transmitted it to accessible place to process, record and display the information in presentable Form.

General telemetry system :-



[Fig-④ Block diagram of general telemetry system]

In primary stage, the 'measurand' is detected by the 'primary detector' and send to the channel Transmitter.

Intermediate stage, consists of the following three elements.

① Telemeter Transmitter
② Telemeter channel.
③ Telemeter receiver.

The "Telemeter transmitter" converts the output of the primary dectector into an electrical signal and Transmits it to the "telemetring channel" This signal is received by a "telemeter reciver" placed at remote location. This receiver converts the signal into a usable form and indicated or

recorded or displayed by the "end device". which is calibrated in terms of measurand. The control device is provided to a take corrective action on measurand through feed back Loop to control the output.

→ For Electro-pneumatic system, pressure is converted to electrical.

→ For Electro-opto convertion, electrical is converted in light.

Standards in data Transmission :-

① Rs 232 standard.

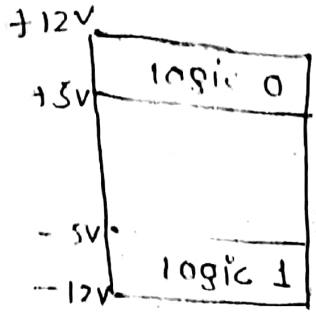
② Rs 422 standard.

① **RS 232 standard :-** Rs 232 standard is most popular serial interface standard betn a computer terminals and a modem. The specification limit the data rate to 19200 bps. with a 50 Foot cable. The voltage standard with typical logic level of -12V for a logic 1 and +12V for logic 0.

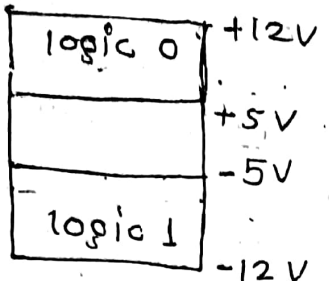
This standard defined the mechanical, electrical and logical interface betn a data terminal equipment [DTE] and data carrier equipments. [DCE]

The data is usually formed by a computer and DCE by a modem.

The controlling the data transfer betn DTE and DCE, the following control signal are used.



RS 232 driver.



RS 232 Reciver.

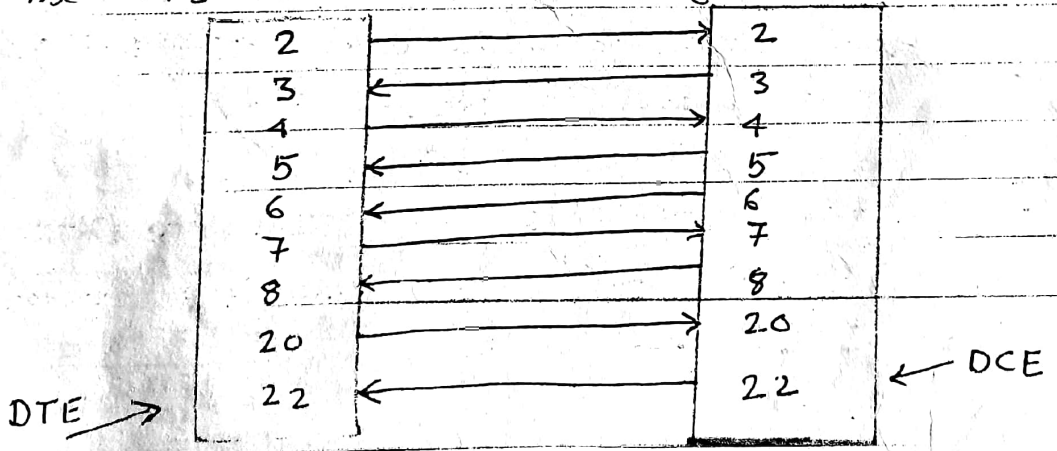
① RTS [Request to send] :- This signal from the DTE to prepare for a data Transfer From the DTE to the DCE.

② CTS [clear to send] :- This signal From the DCE indicates to the DTE that the DCE is ready to accept data from the DTE.

③ DCD [Data - carrier detector] :- The DCE activates the DCD signal if it has detected the carrier signal from the Transmission target and the connection is going to set up.

④ DSR [Data set Ready] :- The DCE is inform the DTE by an active DSR signal that it is switched ON and has completed all preparation for a connection to the target and is ready to communicate with the DTE.

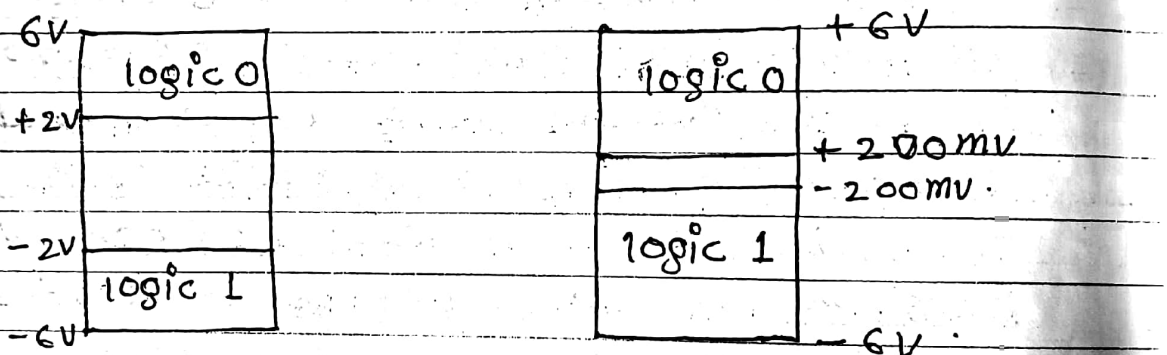
⑤ DTR [Data terminals Ready] :- The signal from the DTE indicates the reading of the DTE



[fig-⑧ interfacing a PC and Modem using Rs 232]

② Rs 422 standard :-

one of the Reason that Rs 232 is restricted to relatively short cable length, is that driver and receiver are unbalanced. The unbalance is due to the reason that ground potentials at the receiving ends and Transmitting nodes will different, so a current will Flow in the common ground wire. This can be minimized using Rs 422 as this standard uses a differential transmitter on receivers. This eliminates the common ground wire. By using the Rs 422, For Higher data rate can be obtained.



Rs-422 Drivel Rs 422 reciver.

[Fig-⑨ Logic level specification of Rs-422]

Data Transmission System & Data type

There are two modes of data transfer: parallel or Serial. Hence

an I/O device is designed to transfer data in either of these two modes. An I/O device connected to a microprocessor transfer data predetermined time. when a number of I/O device are connected to a microprocessor, timing incompatibility may arise. In such cases the task of interfacing becomes difficults. To solve the interfacing problems of I/O devices several data transfer schemes have been developed.

Data Transfer schemes :-

1. Programmed Data Transfer scheme
2. Direct Memory Access [DMA] Data Transfer scheme.

In the programmed data Transfer scheme data are Transferred from I/O device to the microprocess or using a program which resides in the memory. In direct memory access scheme data are directly transferred from the I/O device to the memory without going through the microprocessor. The microprocessor holds on while data are being transferred from the device to the memory. This scheme is used when bulk data are to be transfered. If bulk data are the transferred through the microprocessor, it will be consume appreciable time.

The Programmed data transfer is further classified as follows:-

1. Synchronous Data Transfer.
2. Asynchronous Data Transfer.
3. Interrupt Driven Data Transfer.

① Synchronous Data Transfer :- When the speed of an I/O device matches with that microprocessor, synchronous data transfer scheme is used. Data are Transferred From the microprocessor to the I/O device or From the I/O device to the microprocessor using suitable instructions. For example :- The Intel 8085 uses IN and OUT instructions to transfer data. The IN instructions is used to read data From an input device or input port. The OUT instructions is used to send data from the microprocessor to an output device or output port. As speed of the I/O device matches with that of the microprocessor, it is assumed that the I/O device is ready to transfer data when IN or OUT instructions are issued by the microprocessor.

② Asynchronous Data Transfer :- The asynchronous data Transfer scheme is used when the speed of an I/O device does not match the speed of the microprocessor. In this method of data transfer microprocessor checks whether the peripheral is ready to transfer data or not prior to the actual data transfer. This Form of data transfer is also known as data transfer with

Handshake signals

In here, shows a schematic diagram to principle of asynchronous data transfer.

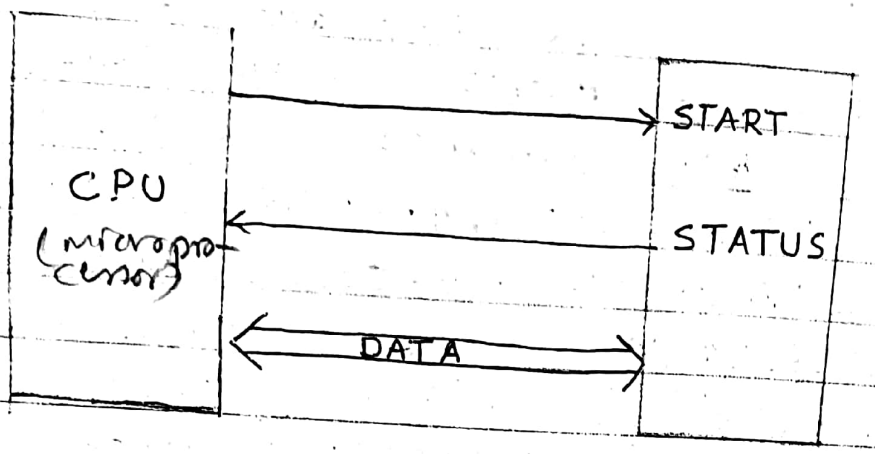


Fig-(9)

The microprocessor sends a START signal to the peripheral device. when the device become ready to transfer data it sends a high STATUS signal to the microprocessor. Until the STATUS signal is high the microprocessor keeps waiting. As soon as the STATUS signal goes high, The microprocessor transfers data from or to the device. In this method of data transfer, signals are exchanged bet^n microprocessors and a peripheral before the actual data transfer. These signals are called the handshake signals.

We can take simple example of asynchronous data transfer, consider the data transfer bet^n an A/D converter and the microprocessor. The microprocessor sends a start of conversion pulse to A/D converter. An A/D converter is

a slow device. It takes some time to convert analog signal into digital signal. At the end of conversion the A/D converter gives an End of conversion signal. The microprocessor is keep in a loop to check the end of conversion signal, As soon as the end of conversion signals becomes high, the microprocessor reads the data.

(3) Interrupt Driven Data Transfer :-

The interrupt driven data Transfer scheme is used when I/O device to be interfaced with µP [microprocessor] is slow. In this scheme when data are ready the device interrupts the CPU. After completing the current instruction at hand the CPU enters into a subroutine to tranfer data from device. Such subroutine is known as interrupt Service subroutine [ISS]. The ISS starts from a particular memory location. This memory location is known as interupt branch address [IBS].

Er, Upendra Yadav

Unit-6 Instrumentation :-

Output Devices :-

Er Upendra Yadav.

Introduction :- The main purpose of any measurement system is to provided information concerning the state and condition of the physical phenomenon being investigated. The measuring system may be activa-ted either directely from the measuring means. eg- bellows, pressure, spiral etc. which indicating pointer is attached directely through lever and leverage system.

The last stage of a measurement system is the data presentation stage, it most be observation instantly by display device or storge for observation at a later stage by a recorder.

The data presentation device is called the "output device".

The factor affecting to the choice betn display device and recorders.

Expected use of the output.

Information content of the output.

The output devices may be two types :-

single number output devices.

Time domain output devices.

single number output devices :- under such conditions, the value of measurement can be regarded as time variant over the time interval during which measurement are made. Thus single number will represent measurement.

e.g- Indicating instruments, Digital display unit, [Inst. O.P varies at very slow rate]

Time domain output device :-

In such conditions, the value of quantity are to be taken as a function of time.

eg - cathod ray oscilloscope [CRO]

*** Electrical Indicating Instruments :-

The Electrical Indicating Instruments are used for measurements of current, voltage, resistance, and power. These instruments can be classified into following -

① Analog instruments :- meters used scale and needle
② Digital instruments :- Reading in exact numerals.

① Analog instruments :- Analog indicators are basically current-operated devices, it is working on principle of "d'Arsonval type of galavanometer principle". This type of device consists of circular or rectangular coil of large number of turns of fine wire and supended bet^n the poles of the permanent magn The coil mounted in position with jewel bearing and is coupled to a pointer-indicat moving over uniform scale.

The torque produced depends upon the coil dimensions, number of turn, flux density and the spring constant.

The resulting deflection [δ]

$$\delta = KIB\cos\theta$$

Where, K = constant of proportionality.
I = current through the coil.

B = Flux density

θ = Angle bet^n plane of the coil and megnetic field [when no current is flowing].

Pointer-scale analog indicators :-

An analog instruments the value of the measured parameter is indicated by positioning of the indicating pointer against a calibrated scale. Here moving pointer with relation to a stationary scale.

single-point indicators :-

Multi-point, multi-pointer and multi-range indicators :-

single-point indicators :- The fixed-scale and movable-pointer indicators, available in a variety of forms.

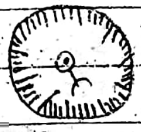


fig-ⓐ circular scale.

fig-ⓑ circular scale eccentric

fig-ⓒ circular scale part circles.

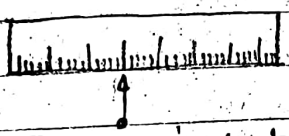


fig-ⓓ straight horizontal scale.

[fig-ⓐⓑⓒ and ⓓ Fixed-scale and movable pointer indicators.]

and different types of scales.

fig-ⓐ Fixed pointer

fig-ⓑ Precision pointer.

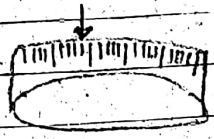


fig-ⓒ Drum type.

[fig-ⓐ ⓑ and ⓒ Fixed-pointer and movable-scale indicators.]

Multi-point, multi-pointer and Multi-range indicators :-

ulti-point indicators :- In this system the indicator pointer can be connected to a number of inputs, one at a time with the help of a selector switch.

Multi-pointer indicators :- This types of indicators contains more than one number of pointer. usually this arrangement is used in recorders and not in indicators.

Multi-range indicators :- An instruments with multi-range indicators has different scales, for different ranges. The choice of particular scale is made by a selector switch.

② Digital Instruments :-

The digital Instruments indicate the value of the measuand in the form of "decimal number" but analog instruments measuand value in term's of deflection of pointers.

The digital meters work on principle of "quantization".

A digital instruments can be considered as a counter which counts the pulses in a predetermined time. Digital transducers whose output is the form of pulses are used to monitor the desired parameter.

The information in the electronics digital read-out [display] devices is presented as a series of digits on tubes, screen or printed on a piece of paper.

Accuracy of digital instruments is depends on the number of pulses generented by Transducer. In this system less possibility of error produced The relevant characters Letter alphabet from A to Z, numerals from 0 to 9, punctuation mark, and other symbols can be generated by.

① Semiconductor light emitting diodes [LED]
② Liquid crystal displays [LED]
③ Numerical indicators tubes [NIT]
④ Hot filament or bar tubes etc.

① Light Emitting Diode [LED] :-

A P-N Junction can absorb light energy and produced electric current. The oppasite process is also possible, that is a Junction diode can emit light. The emission of light occurs under Forward bias condition [due to electrons and holes]. The emitted light may be visible or invisible.

A P-N Junction diode, which emits light when Forward biased is known as Light emitting diode [LED]. The amount of light output is directly proportional to the Forward current. Solhat the higher the Forwaed current, higher is the light output.

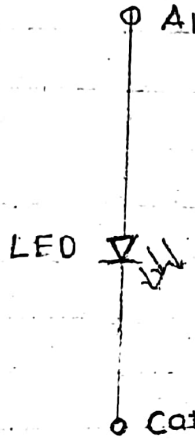
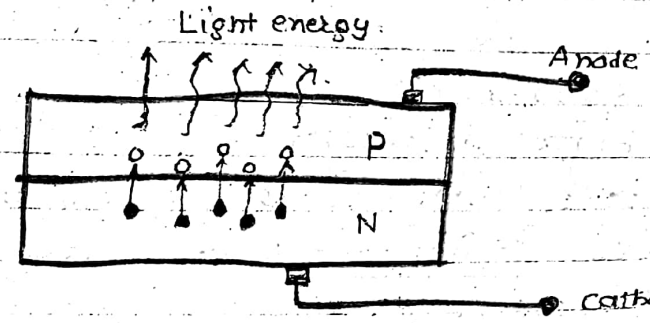


fig-ⓐ Symbol



[fig-ⓑ Basic Structure]

In a Forwaed based P-N Junction; Free electrons from N-type material diffuse into P-region. onces in P-region these Free electrons encounter holes and eventually recombine. The Free conduction electron fills a vacancy in covalent structure and thus becomes a valence electron, so the electron loses a certain amount of energy as it Jumps form conduction band to the valence band. The energy lost by recombining electron is given off in the form of light energy.

Advantage :-

1) High efficiency.
2) long life.
3) They occupy small area.
4) Available in different colours like, reds yellow, green.
5) Economical and high degree of reliability.

Disadvantage :-

① LEDs are not suited for large areas display because of their high cost.

Applications

LEDs operate at voltage level 1.5 V to 3.3 V. They are highly compatible with solid state ckts.

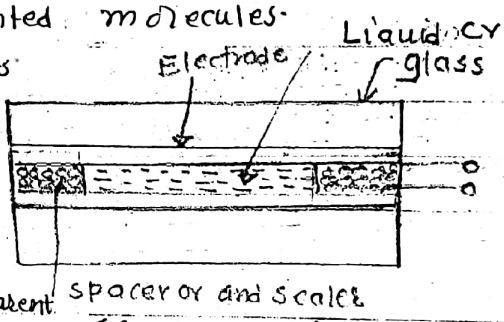
Uses:-

panel indicator, Digital watches, multimeters, calculators, switch boards, Alarm systems, optical fiber communication system etc.

② LCDs [liquid crystal Displays] :-

A liquid crystal is material, usually an organic compound, which flows like liquid at room Temp. Its molecular structure has some properties normally associated with solid. when light is incident on an activated of liquid crystal, it is either absorbed or scattered by disoriented molecules.

A liquid crystal 'cell' consists of thin layer [10 um] of liquid crystal sandwiched bet two glass sheets with Transparent electrodes deposited on their inside face. Both glass sheets are Transparent cell is known as Transmittive type cell. when one glass is Transparent and other has a reflective coating, The cell is called reflective type.



[Fig-④ A liquid crystal cell]

Features of LCDs

① They are light scattering. ② They can operate in a reflective or Transmissive confⁿ. ③ power required by LCDs to scatter or absorb is extremely small of order of few uw/cm at low voltage range 1 to 15 V. ④ The response time range 10 and 100 ms.

Advantage :-

① low power requirement
② low cost
③ long life [50,000 hours].

Disadvantage :-

① Slow devices, turn on time milli-seconds, turn-off time tens of milli-seconds.
② large area occupy.
③ used in D.C. as well as A.C. [Frequencies less than 500 Hz]
④ Poor visibility.
⑤ Temp range of operation [0-60°C]
⑥ low reliability.

Recorders :-

A recorders records electrical and non-electrical quantities as a function of time. The recorder may show how one variable varies w.r.t another or how the input signal varies with time. The recorder serves the following objectives

- It provides at galance the overall picture of performance of unit.
- It provides on the action taken by the operator.
- It measurement details of a particular time.

Types of Recorders :-

In an instrumentation system, there is most important considerations, which are data required is recorded. The recordering method should be consisetent with the type of system. In fact, it may wholly analog system, then analog recording techniques should be used. If and digital output, then digital recording devices are used.

Two types of Recorders :-

Analog Recorders :-

Digital Recorders :-

Analog Recorders :- (i) Graphic recorders :-

- (a) Strip chart Recorders :-
  - (i) Galvanometer type
  - (ii) Null type
    - (i) potentiometric recorders.
    - (ii) Bridge recorder
    - (iii) LVDT recorder.
- (b) circular char recorder.
- (c) x-y recorder.

(ii) oscillographic recorders.

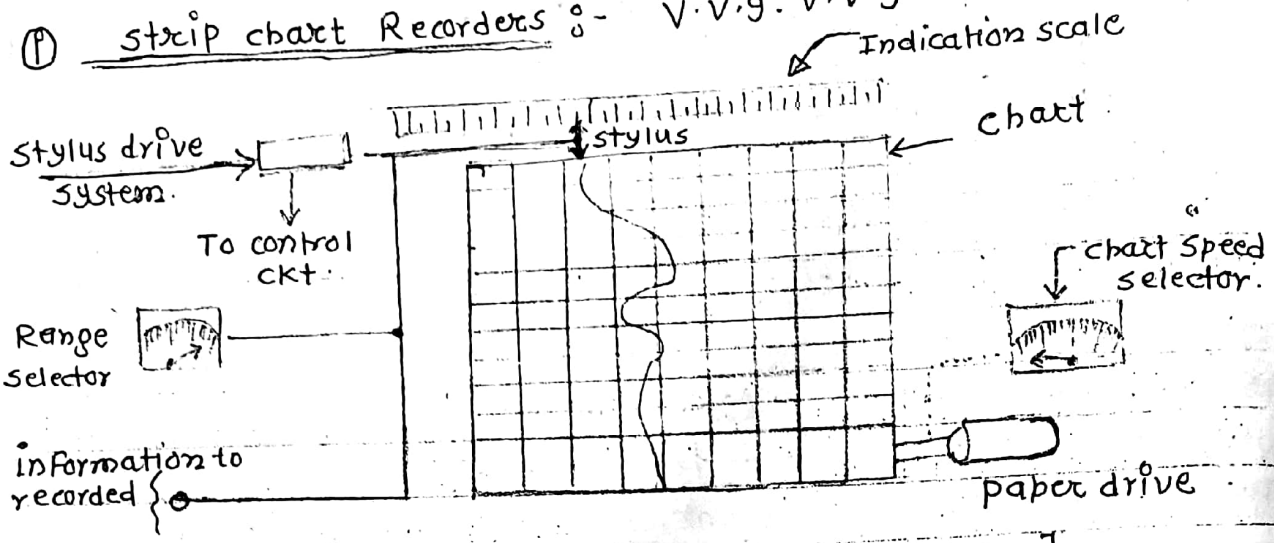
(iii) Magnetic type recordees.

Graphic Recorders :-

A "graphic recorder" may defined as instrument, which draws a graph that relates two or more variables to time or to each other. A "graph" is an analog representation of discrete information. In other words, Basic elements of the recorder includes chart for displaying and storing the recorded information. A stylus moving in a proper relationship to the paper and suitable

means of interconnection to couple the stylus with the source of information.

① Strip chart Recorders :- V.V.g. V.V.g.



[Fig-④ strip-chart recorder.]

A strip-chart consists of the following :-

→ A long wall [roll] of graph paper moving vertically.

→ A system for driving the paper roll [wall] at selected speed.

→ A stylus driving system for driving the stylus at some selected speed. A speed selector switch is generally provided.

→ A stylus for making marks on the graph paper. The stylus moves horizontally in proportion to the quantity to be measured.

Recording mechanism :- A roll of paper is continuously moving vertically with help of paper drive mechanism. A stylus attached to the stylus drive system move horizontally in response to the information to be recorded. Thus a stylus will make a moving on the vertically moving paper depending on the position gained by it.

Advantage and Disadvantage of strip-chart recorders

Advantage :-

1) Data conversion is easier, when rectangular coordinates are used.
2) Recorders requires the use of servo-mechanisms to position the pointer or pen. limitation on weight of pen, pressure betn pen and paper or length of the pointer.
3) Large amount of paper can be inserted at one time in the form of a roll.
4) Many more separate variable can be recorded on a strip chart than on circular chart.

Disadvantage

1) more complicated mechanism.
2) Observing behaviour several hours.

Applications :-

1) Temp. recorders;
2) sound level recorders.
3) Recording amplifier drift.

Types :- Galvanometer type
Null type
Potentiometric rec
Bridge recorder
LVDT recorder

4) X-Y Recorders :-

A X-Y recorders is an instruments which gives a graphic record of the relationship betn two variables.

This system has a pen which can be positioned along the two axes with the writing paper remaining stationary. There are two amplifier units, one amplifier actuates the pen in the Y-direction as the input signal is applied to the other amplifier actuates the pen in x-direction. The movements of the pen in x-and Y-directions are automatically controlled by motor, pulleys and a linear-potentiometer. An e.m.f is plotted as a function of another e.m.f. There are many variations of X-Y recorders.

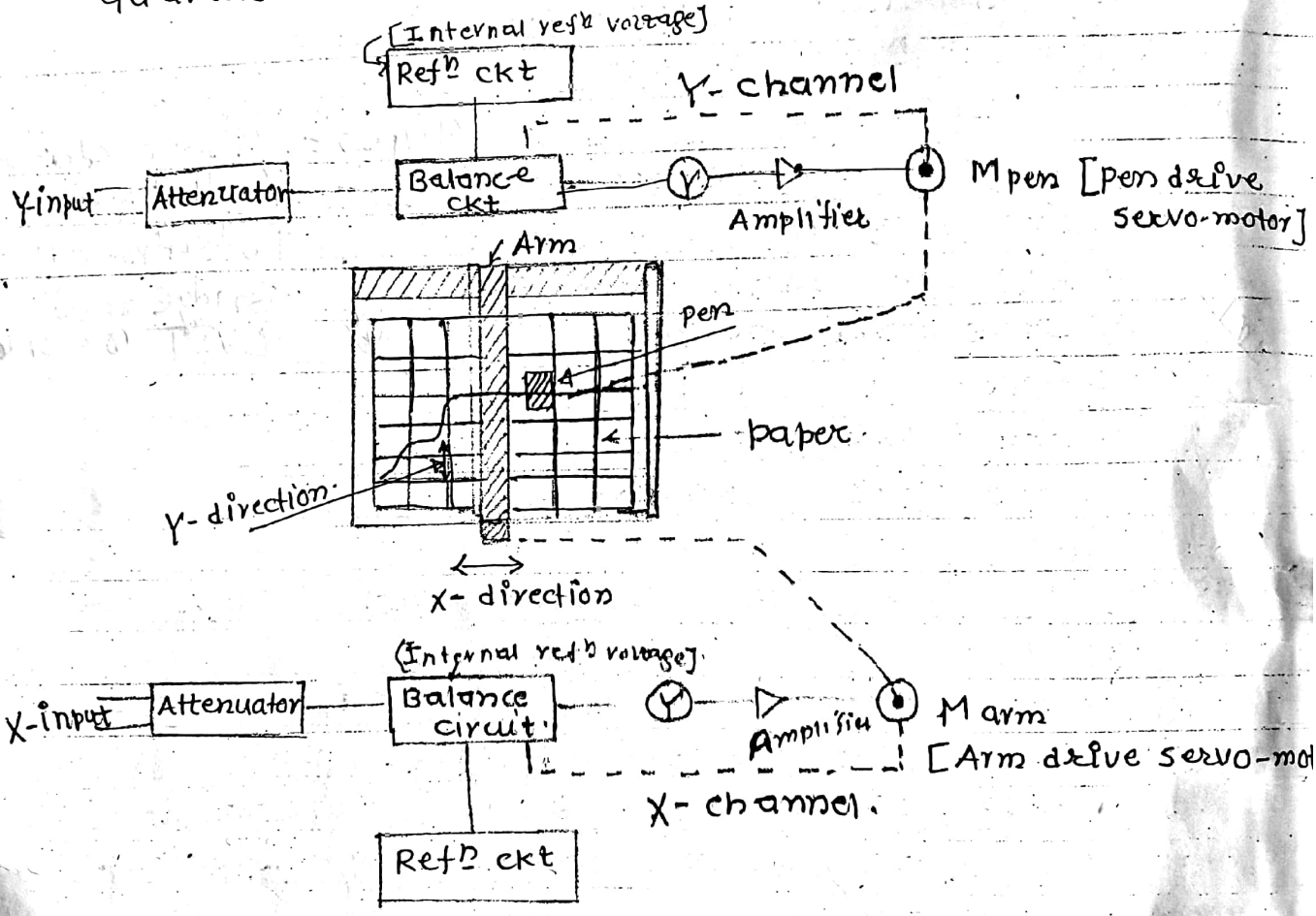
The Block diagram of x-Y Recorders shown in below is.

A signal enters in each of two channels.
The signal are attenuated to the inherent full scale range of the recorder.

The signal then passes to a balance ckt, where it is compared with an internal ref^{n} voltage.

→ The error signal [diff^{n} betn input signal voltage and ref^{n} voltage] is fed to a "chopper" which means converts D.C. signal to an A.C. signals.

→ The signal is then amplified in order to actuate a servomotor which is used to balance the system and hold it in balance as the value of the quantity being recorded changes.



[fig- @ X-Y recorder]

Advantage :-

① The relation betn either non-electrical, and electrical quantities can be recorded.

② In modern types of recorders, zero offset adjustments are available.

③ The Instantaneous relationship betn two physical quantities can be recorded.

* Applications :-

① plotting stress-strain curves, hysterisis curves,
② pressure-volume diagram for I.C engines.
③ Electrical chart of materials, such as resistance versus temp. plotting.
④ Speed-Torque chart of motor.
⑤ Regulation curve of power supplies.
⑥ Plotting chart of zener diodes, vacuum tubes, rectifier and transistors etc.

The marking machanism in X-Y plotter may be:-

① Marking with ink filled stylus.
② Marking with heated stylus.
③ Electric stylus marking.
④ chopper bar marking.
⑤ optical marking method.
⑥ Electrostatic stylus.

V.V.g, V.V.g 2011C

Magnetic data Recorder [or magnetic type recorder]:-

Principle :-

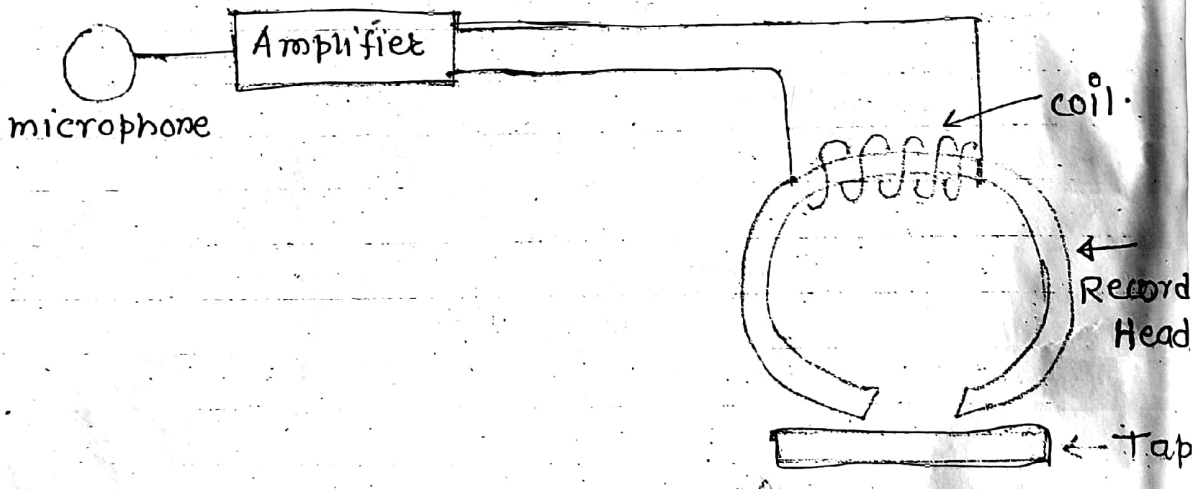
It is based on the principle that if magnetic field is applied in some materials like iron oxide, then that magnetic materials gets magnetised and retain that magnetism permanently until an altered.

Magnetic data Recorder. Fig-① given below.

Sound pressure vibration is first converted into electrical signals by ~~microphone~~ microphone whose o/p

is fed to the coil of electromagnet via amplifier. The electromagnet has a small air gap which has high reluctance. when a tape coated with magnetic material like iron oxide is made to pas across the gap, the lines of the force gets an easy path through the tape and magnetise the iron oxide permanently. The portion of the iron oxide on the tape gets magnetised depending on the audio current. Thus sound energy is recorded in the form of magnetic energy using magnetic data Recorde

In reproducing process, the recorded tape is again made to pass through the similar gap and this will change the lines of force in t coil which induce e.m.f in the coil. This e.m.f is amplified and is fed to a loud-speaker, which con audio-signal into sound.



[fig-④ magnetic-data Recorder]

magnetic data recorders [Advantage] :-

1. low distortion.
2. wide freq. range from DC to several MHz.
3. The recorded signal is immediately available with no time lost in processing. The recorded signal can be played back, or reproduced as many times as desired without loss of signal.
4. Multi-channel recording possible.

Applications :-

These recorder are available in various size and in various forms [portable, semi-portable]

1. communication surveillance and spying.
2. Data recording and analysis on missiles, aircrafts, and satellites.
3. Medical research and patient monitoring.
4. Industrial research and production monitoring and control.

Unit-7

SN

Data Acquisition systems :-

Introduction :-

Data Acquisition system may be defined as the system used for data processing, data Transmission and data storage.

Data-acquisition systems are used to measure and record analog signals in two different ways :- which are given below :-

(1) signals which are begin, will be direct measurement of electrical quantities. These signal may be A.C. and D.C. voltage, resistance, freq. etc.

(2) signals which originate from use of Transducers.

Types of Instrumentation system :-

The instrumentation system can be categories into two types :-

(1) Analog system.

(2) Digital system.

(1) Analog system :- This system deal in the analog form. Analog system is continuous function.

(2) Digital system :- Digital system which is the discrete or discontinuous pulses. For example :-

fig-(1)

Components of Analog and Digital Data Acquisition system :-

(1) components of Analog data Acquisition System :-

vantage of analog computer can be recorded in analog form or to digital form recording.

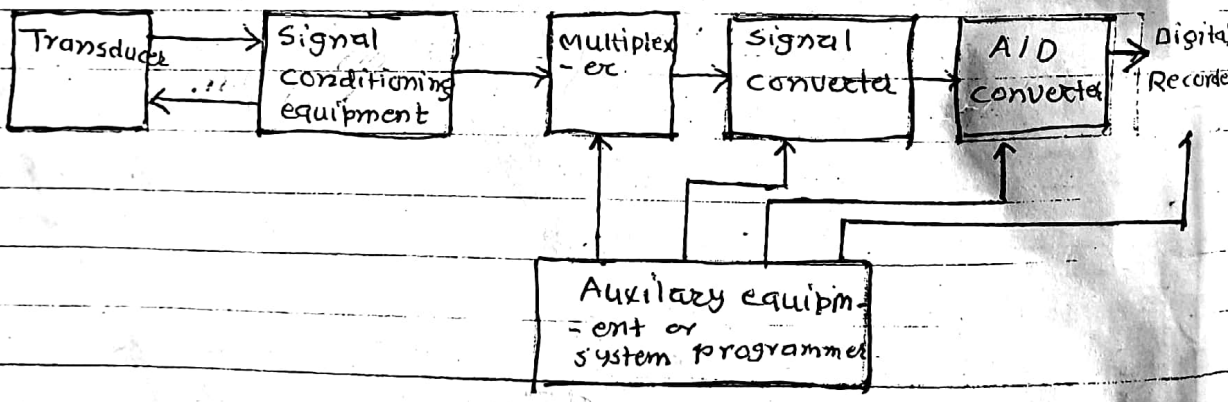
⑨ High speed cameras and TV equipment :- In industrial processes, many engine testing and aerodynamic testing is not possible, For operator so that, High speed cameras and TV equipment is used. for visual Observation, and records of this process For analysis.

② Components of Digital data Acquisition system :-

The components of digital data Acquisition system is given belows.

① Transducer
② signal conditioner equipement.
③ scanner or multiplexer.
④ signal converter.
⑤ A/D convertet.
⑥ system programmer or Auxiliary equipments.
⑦ Digital recorders.
⑧ Digital printer.

The ckt diagram of Digital data Acquisition system is given belows.



[Fig-⑨ components of digital data Acquisition system]

The functional operations of digital data acquisition system:

(a) Analog signal handling.
(b) measurement making.
(c) Data converts to digital Form.
(d) control and programming.

Different components of digital data Acquisition systems :-

(1) Transducer :- converts the physical quantity to electrical signal.

(2) signal conditioning equipment :- See to back page.

(3) Scanner or Multiplexer :- More than one input in single channel. Therefore more analog input accept the multiplexer and sending sequentially to the measuring instruments. It is also called "scanner".

(4) signal converter :- A signal converter Translates the analog signal to a form acceptable by the analog to digital converter. For example :- Signal converter [amplifier] is amplifying the Low-level signal voltage produced by the Transducer.

(5) A/D converter :- An A/D converter convert the analog voltage to its equivalent digital form.

(6) Auxiliary Equipment :- This contains devices For system programming function and digital data processing.

(7) Digital Recorders :- Information are recorders in the digital form. which information recordes in, floppy, discs, magnetic tape, etc.

⑧ Digital Printers :- After completing all the process the digital printers are prints the required records. [high quality of hard copy for records.

Use of Data Acquisition systems :-
or
Application of Data Acquisition systems :-

Data acquisition systems find wide in a variety of industrial and scientific area" including the area - space, biomedical and telemetry industries.

The types of data acquisition system to be used depends upon the application and intended use of recorded input data.

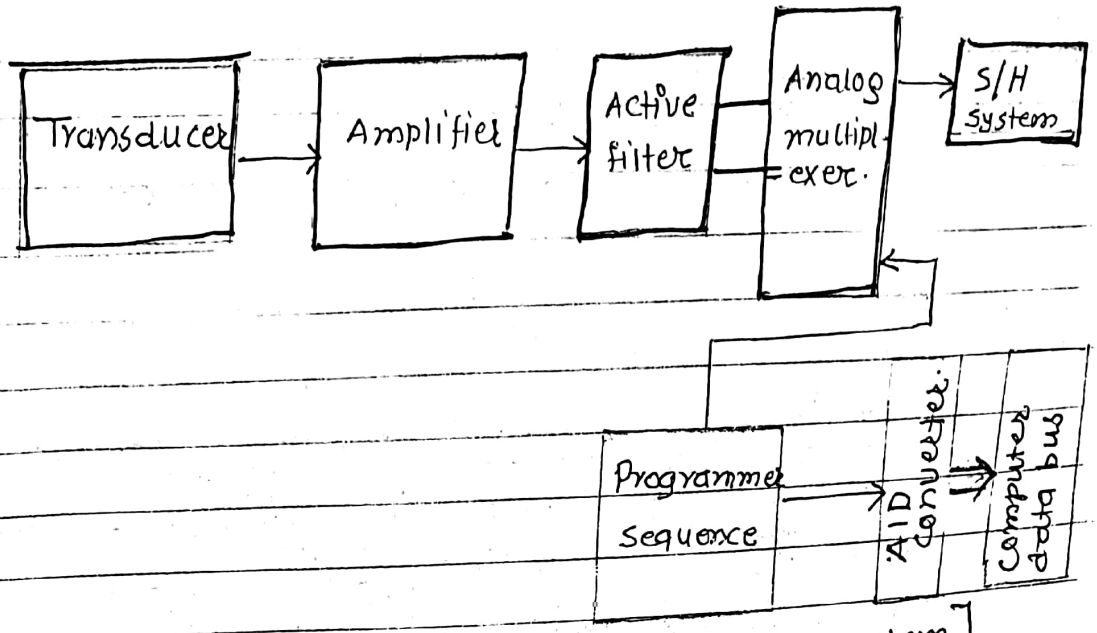
ⓐ "Analog data acquisition System" are generally used when wide band-width is required or when lower accuracy can be tolerated.

ⓑ "Digital data acquisition system" are used when the physical quantity being monitored has narrow band-width. This systems are also used when high accuracy. This systems are more complex than analog systems.

01/sp

Modern Digital data acquisition system :-

The digital data acquisition system fig-① is given below.



[Fig-ⓐ Digital data Acquisition system]

In electronics device, that perform the interfacing function bet^n Analog and digital, There are the converts the analog signals to digital signal and digital signal to analog signal. which are shortly written as A/D converter or ADC and D/A converter or DAC. Apart form, this system data converters are used include data telemetry system, pulse coded communication Automatic test system, computer display systems, data logging systems and sample-data control system. In addition of this every Laboratory systems digital multimeter or digital panel meter contain an A/D converter. Besides, A/D and D/A converters, data acquisition system may employ Following ckt functions :-

ⓐ Transducer.
ⓑ Amplifier.
ⓒ Active filter.
ⓓ Nonlinear-analog functions.

(e) Analog multiplexers.

(f) Sample - holds ckt.

(a) Transducer :- The input in the system is physical parameter such as Temp, pressure, acceleration, position, flow are the analog quantities. The Transducer change physical parameters to electrical signal. The Transducer output may be high impedance signal, common mode noise, current output and signal combined or to increase to high voltage.

(b) Amplifier or signal conditioner :- To boosts the the amplitude which produced by Transducer output signal and sending for further processing. The Transducer output signal may be μV or mV level signals, which are also increases to 1V to 10 levels. The amplifier sometime also flow the non-linear signal.

(c) Active filter :- The signal from the amp^r reached to active filter [Low pass active filter] The active filter reduced the high freq. signal components, unwanted electrical signal noise, and electronics noise. etc.

(d) Nonlinear-analog functions :- ckt that performs nonlinear analog operation on the high-level-signal. such operation include the squaring, multiplication, division, rms conversion or linearization. The analog signal is produced from the Non-linear analog functions

(e) Analog - Multiplexers :- The analog signal next goes to an analog multi - plexer which having the sequentially switches betn a number of different analog input channels. Each input is connected to input of the multiplexer for a specified period of time by the multiplexer switch.

(f) Sample - holds ckts - During the connection time of multiplexer switch, The sample - holds ckt charn are acquires the signal voltage and then hold its value while an analog-to-digital converter converts the value into digital form. The resultants the Digital words goes to the computer data-bus or to the input of a digital ckt.

In data acquisition system, configuration, Instead of multiplexing high-level signals, low-level multiplexing is used. In this method only one amplifier is required but its gain may be changing, from one channel to the next during multiplexing. Another method is, amplify the signal and converted to digital - form at Transducer location and goes to digital information in serial form to the computer.

In data acquisition system Several amplifiers are used, as isolation amplifier, or special-type amplifier is chopper stabilized amplifier for accuracy amplify.

Modern Trend in Data acquisition system

The Modern trend in data acquisition system Block diagram is given below.

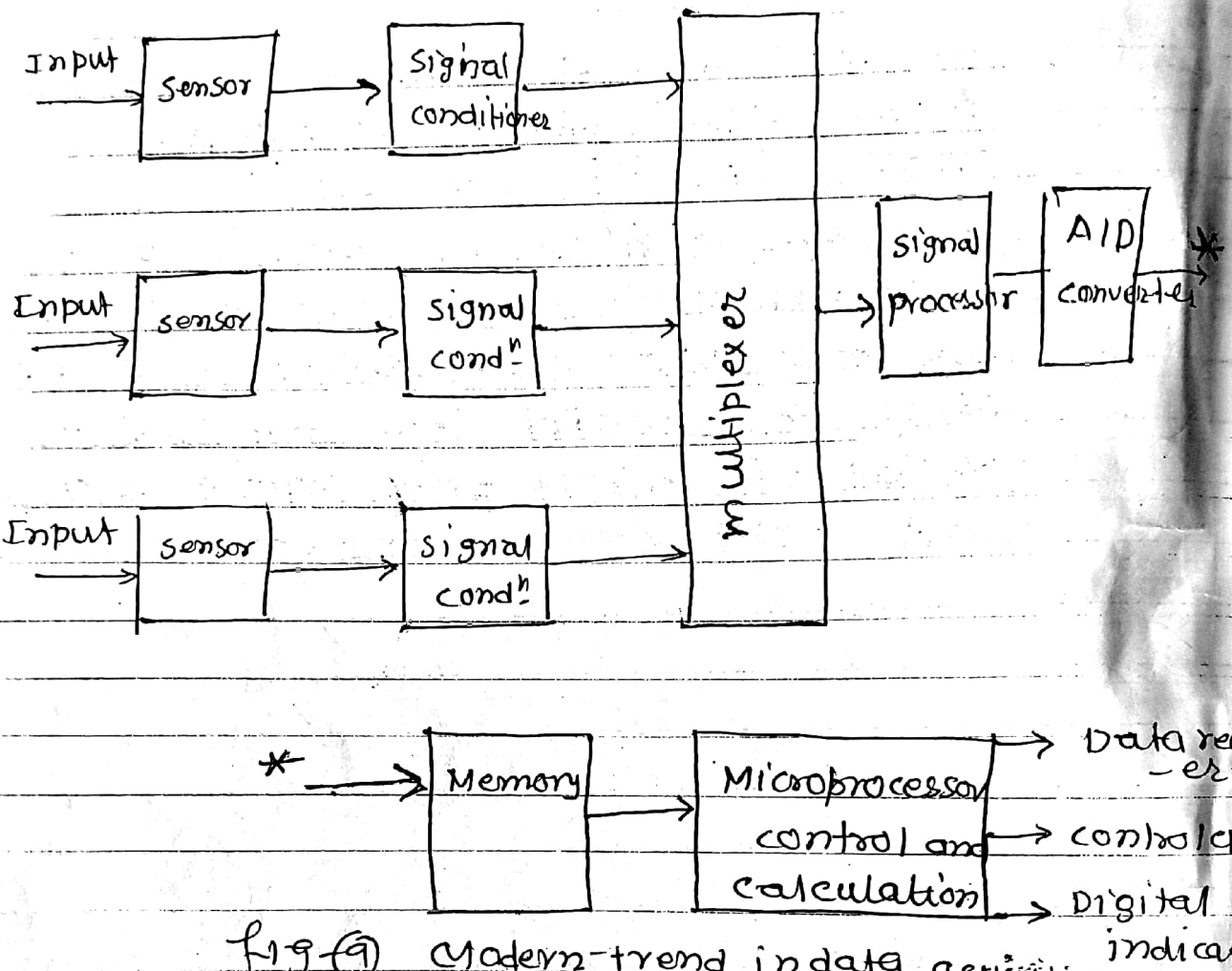


fig-(9) Modern-trend in data acquisition

Modern-Trend in data acquisition system has some expansion of acquisition system or new system of Digital data acquisition System. But in this system up is used for control and calculation of processing data.

It having the following components which are given belows.

(a) Sensor :-
(b) signal conditioner :-
(c) Multiplexer :-
(d) signal processor :-
(e) A/D converter :-
(f) Memory :-
(g) Microprocessor :-

Reader should explain above term's as itself. [which are explain many time in Previous chapters]

(h) µp :- µp has in built the chart of programming to monitor or control the measurement data. It is the testing the logics, For the short period of time, and more accuracy and efficient of system.

Short notes

RF Telemetry :-

Telemetry is Technology that enables the user to correct data from several measurement point at inaccessible or inconvenient location. There is no physical link betn the Transmitting stations and reciving stations.

The link betn Transmitting stations and the reciving stations can only established through radio link. For example:- An air craft on a test flight has many parameter which change during the flight, ie amount of fuel, fuel flow, Engin position or performance, Vibrations of critical parts, Temp. of different component etc. The test pilot monitor and observing the threading of meters on panel and Time permits threading of those instruments, Even those are not sufficiently accurate for detailed flight analysis.

An alternatively, specialist of engineer invozved in the design and production of the air-craft analysis of data produced and suggest the corrective action. This solution is not practicable.

Another alternative would be to put a sophisticated computer on the flight for analysis of data. This is again not a satisfactory solution. The best way to locate the team of engineers on Land based Station and the test the data be

Transmitted through radio-links From the air-craft to be Land station. so that it is most environment to corrective analyses to measure.

The rocket or unmaned space craft present more obvious need for a radio-link base Telemetry. RF Tel-emetry is usually more suitable if the data is to be Transmitted over distance greater than 1 km; Also certain parts of ~~radio-freq~~ spectrum have been allocated For Telemetry. micro wave links above 4 MHz; Radio-wave at these frequcies tend to travel in stright lines and disc antennas on high-building towers every 30 to 60 km. The radio link PDM and FM with pulse duration varying from minm of 100 us to [Zero-level signal] and maxm 700 us [maxm level signal]