EIPC (NEE-403)
Unit-4
Display Devices & Recorders

RECORDERS

- **Recorder records an electrical or nonelectrical quantities as a function of time . Classified into**
- **Analog recorders**

A) Graphic recorders(Strip Chart Recorders ,X-Y recorders)

B) Oscilloscopic Recorders

C) Magnetic tape recorders

- **Digital recorders**
- A) Incremental
- B)Synchronous

Strip Chart recorder

- Chart recorder: (Recording Oscillographs)
  - most common type: permanent magnet moving coil (PMMC).
  - The PMMC is very similar to the Galvanometer movement.
  - A writing pen replaced the meter point.
  - Current flowing in the moving coil creates a magnetic field that interact with the magnetic field of the permanent magnet. This will cause deflection of the pen.

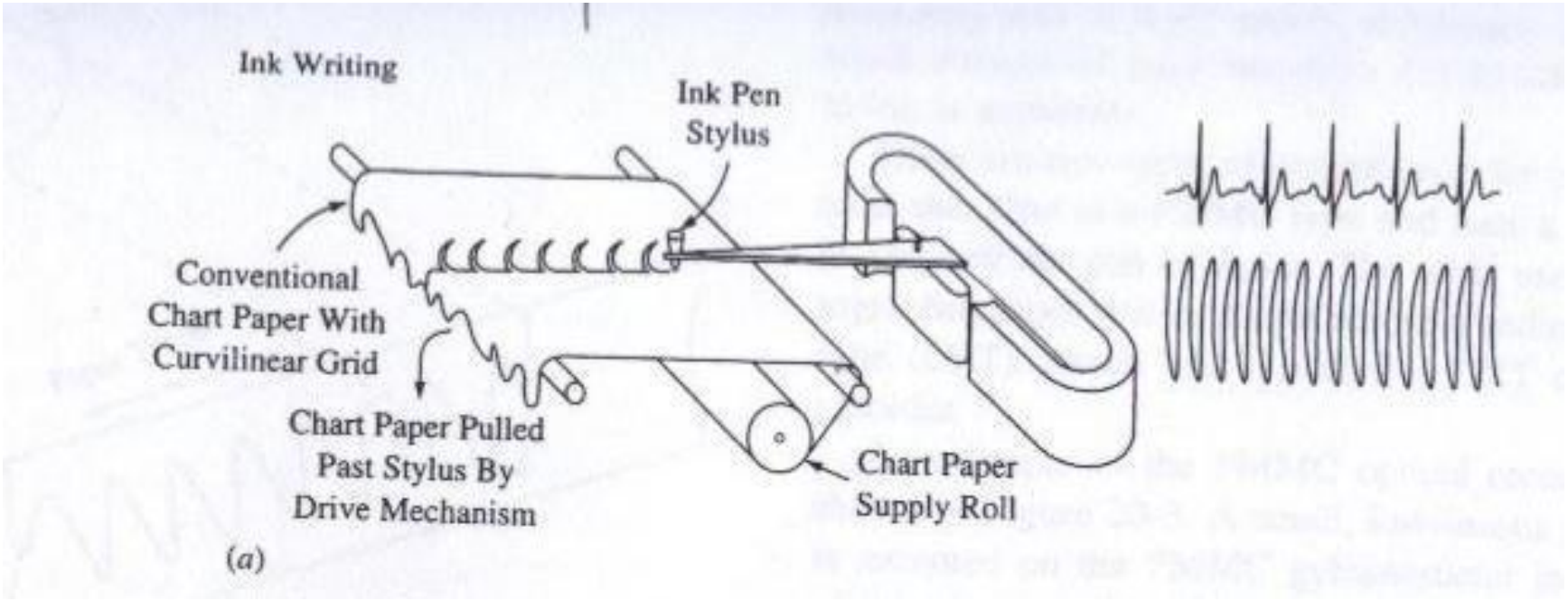
Strip Chart recorder

- Chart recorder: (Recording Oscillographs)
  - The tip of the pen is positioned over a strip of chart paper that is pulled under the pen tip at a constant speed. In this mechanism:
    - Y-axis is the deflection to the pen and
    - X-axis is the time base established by moving the chart paper at a constant speed.

- This will produce a chart recording of the waveshape of the applied waveform

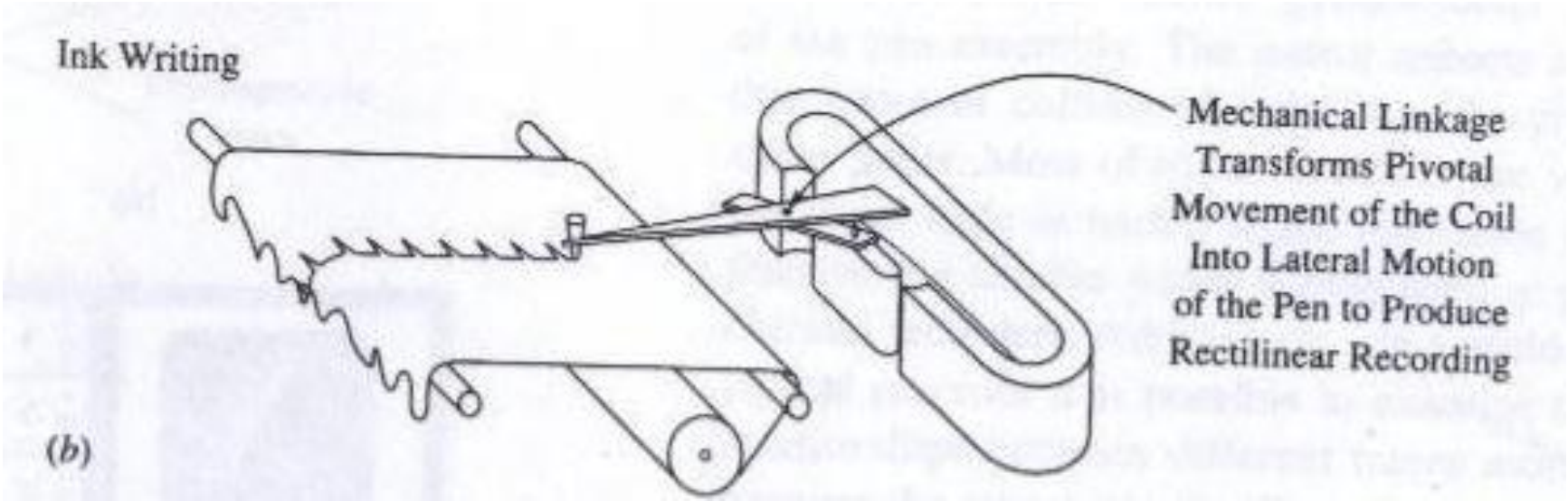
Curvilinear recording

- The pen assembly sweeps an arched manner and so will write in a curvilinear manner.



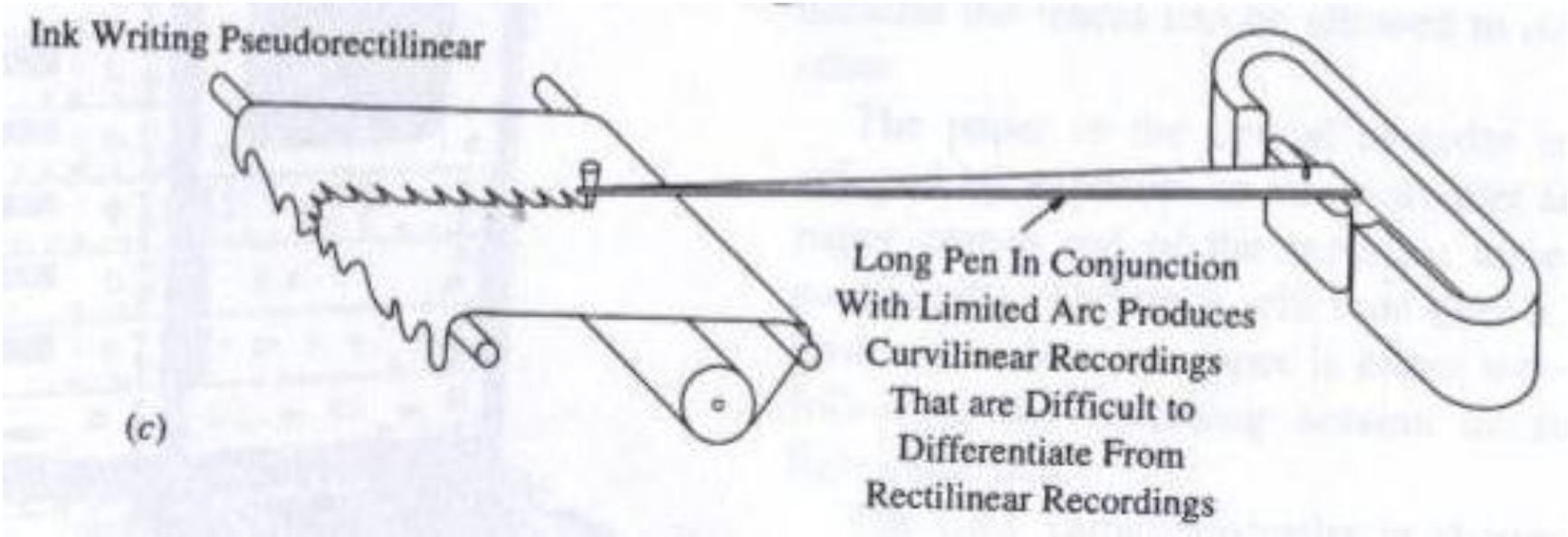
Rectilinear recording

- The pivoted pen motor assembly is a solution of curvilinear action.
- The pen is connected through a mechanical link that translates the curvilinear motion of the PMMC to the rectilinear motion at the pen tip.



Pseudo rectilinear writing system

- In this type of recorder the pen assembly is very long compared to width of the chart paper.
- The pen tip, therefore travels in an arc the length of which is very short compared with the radius.
- The trace will appear to be nearly linear



Writing Methods Used in Strip Chart Recorders

- Thermal, and Direct contact
- Both of these types use a special writing stylus (rather than a pen and a knife edge, also called writing edge)
- The mark on the paper by the contact of the stylus on the paper along the knife edge,

Writing Methods Used in Strip Chart Recorders

- The stylus tip travels in a curvilinear path, but the resulting trace is rectilinear because the knife edge is straight.

- The stylus can write anywhere along its length, so by keeping the knife edge straight under the paper, we obtain the rectilinear recording that shows waveshape as well as amplitude

PMMC writing system

- Several writing systems are commonly used on PMMC recorders:
  - 1- direct contact,
  - 2- thermal pen
  - 3- ink pen
  - 4- ink jet
  - 5- optical

PMMC writing system

- Recorder that use any type of pen (ink) or stylus (Direct contact and thermal) have a relatively low-frequency response due to the inertia of the pen or stylus assembly (100-200 Hz) Ink jet and optical type

- Lighter weight fixtures and writing stylus system have a frequency response of 1000-3000 Hz

Direct contact

- The direct contact uses a special types of chart paper that is chemically treated to have a carbonized back.
- When a pressure applied to that front of the paper a black mark will appear.
- Most of these instrument have a frequency response of less than 25 Hz and so are not commonly used in medical instrumentation.

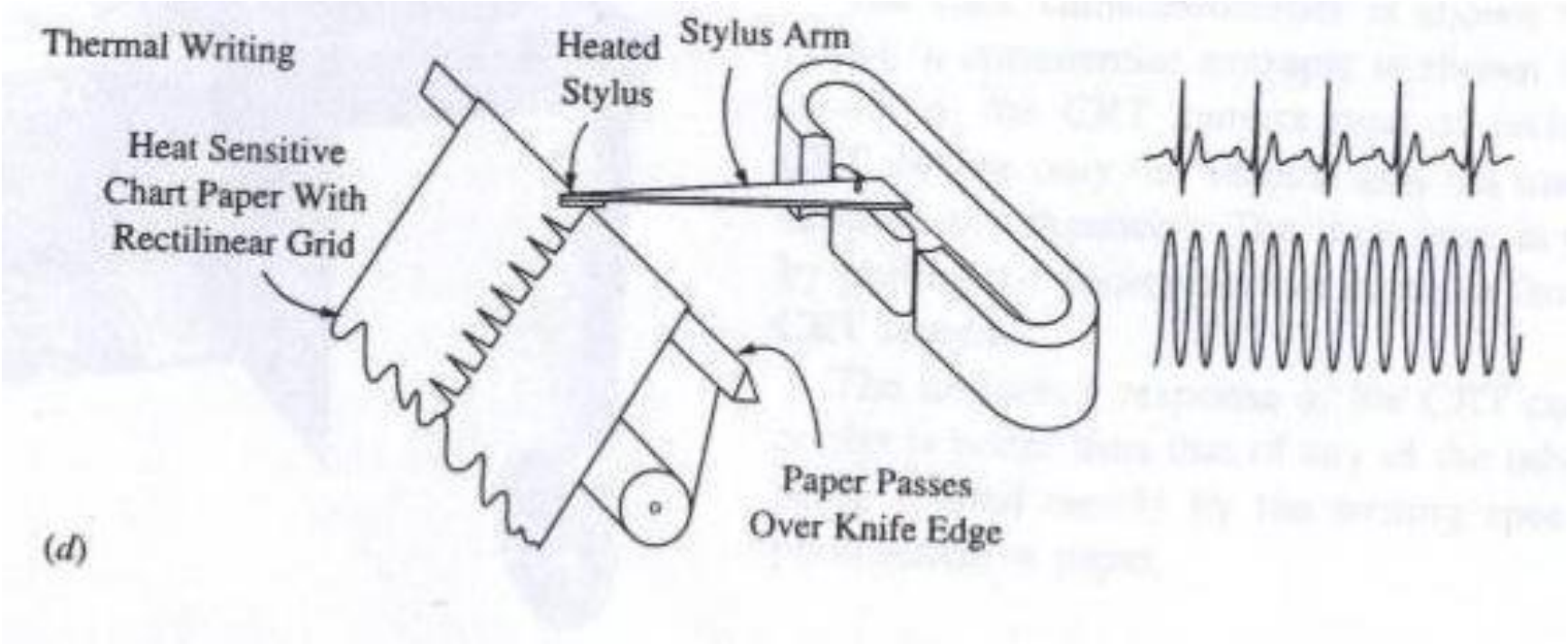
The thermal recorder

- The thermal recorder also uses special paper, but in this case it is waxed or treated with paraffin so that it will turn black when treated

- The thermal recorder is the most commonly employed in medical instrumentation, especially in cardiovascular instruments such as the ECG and pressure monitors

The Stylus

- The stylus in a thermal system is little more than a heated resistance wire connected to a low voltage ac or dc power supply.
- Early models formed a U-shaped electrical resistance element
- Modern models use a wire inside a cylindrical metal stylus
- In both cases a low voltage electrical power supply energizes the element, causing the tip to become heated.
- The black mark is made at the points where heated stylus touches the paper


Thermal Writing
Heated Stylus
Stylus Arm
Heat Sensitive Chart Paper With Rectilinear Grid
Paper Passes Over Knife Edge
(d)

Optical recorder

- There are two types of optical recorder:
- - PMMC type uses small inertia mirror in place of the pen assembly or stylus.
- - The other uses a photographic paper that is pulled across a cathode ray tube and is called a CRT camera recorder.
- Most of these recorders use wide paper.
- On multichannel optical recorder it is possible to examine the time relationships between different traces more easily because the traces can be allowed to overlap each other.

- The paper in the optical recorder is often develop by exposure to an ultraviolet lamp as the paper comes out from the recorder.

- Unless the paper is either wet developed following the recording session or stored in a light-light box.

- In CRT camera, the CRT sweeps only the vertical axis.

- The time base is provided by pulling the photosensitive paper in the front of the CRT screen.

- The frequency response of the CRT camera recorder is better than that of any of the other types, being limited mostly by the writing speed of the photosensitive paper.

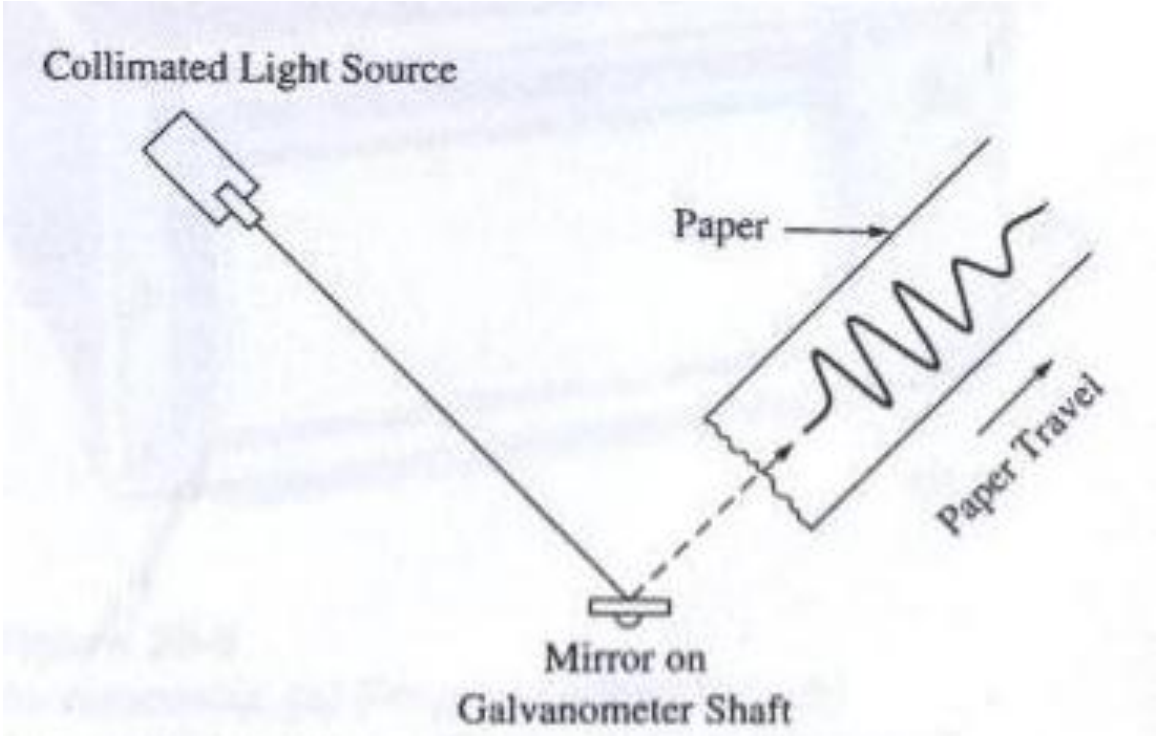
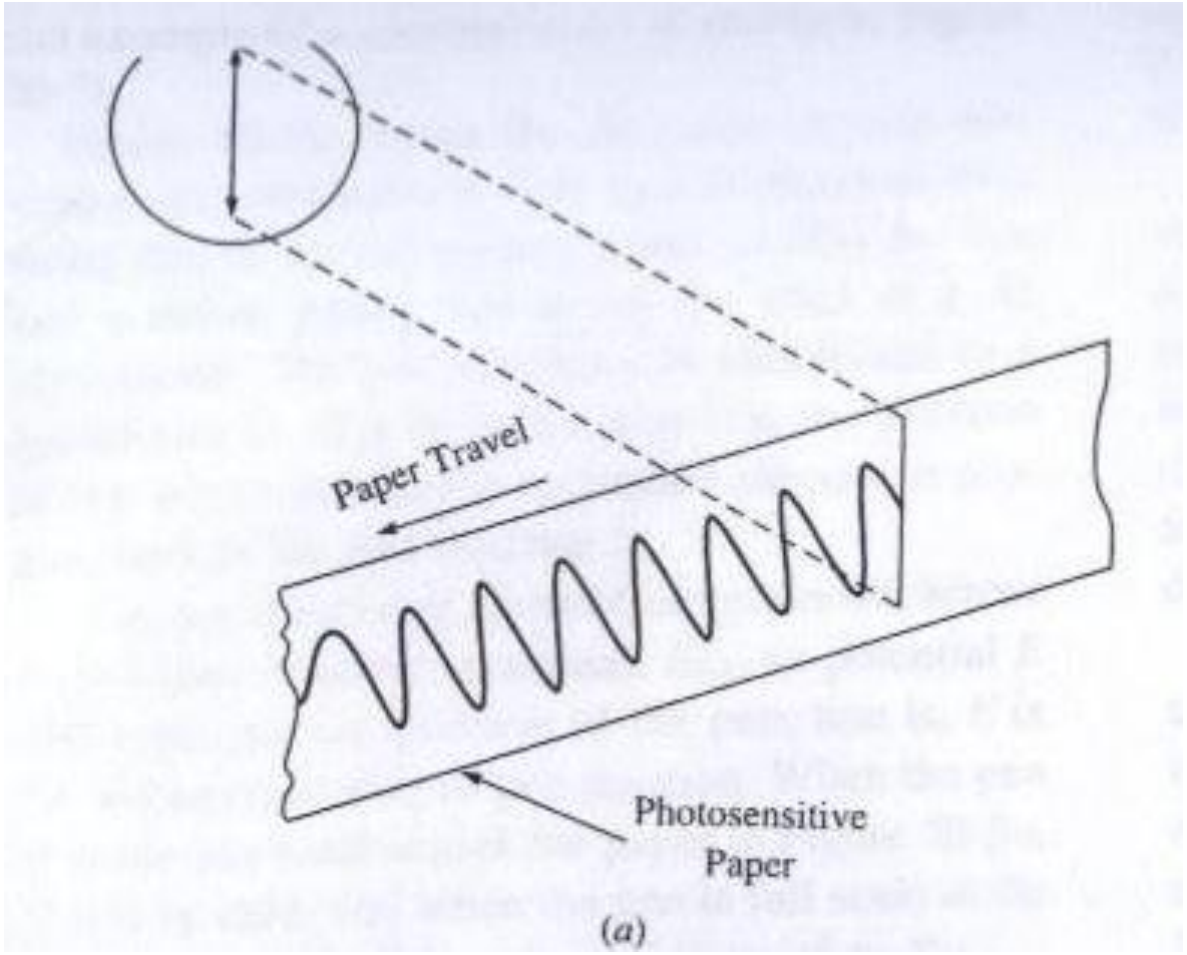
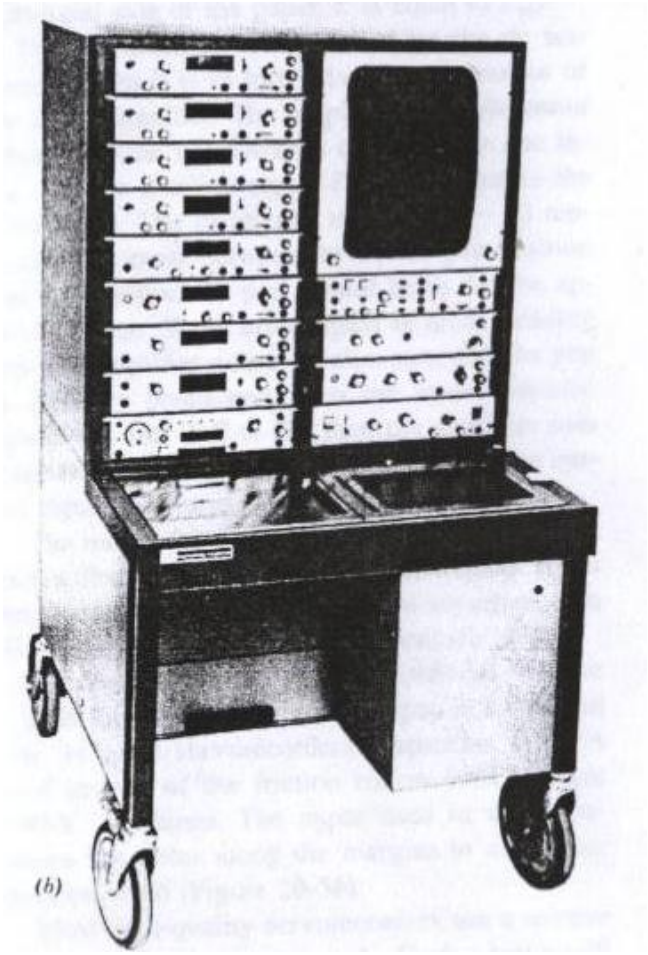


Figure 20-3
Light-beam galvanometer.



(a)



(b)

Magnetic Tape

- Offline storage
- Archival purposes
- Disaster recovery
- Tape Cartridges
  - 20 – 144 tracks (side by side)
  - Read serially (tape backs up)
  - QIC – quarter inch cartridge (larger size)
  - DAT – digital audio tape (small size)
  - Size typically includes (2:1 compression)

Thank You