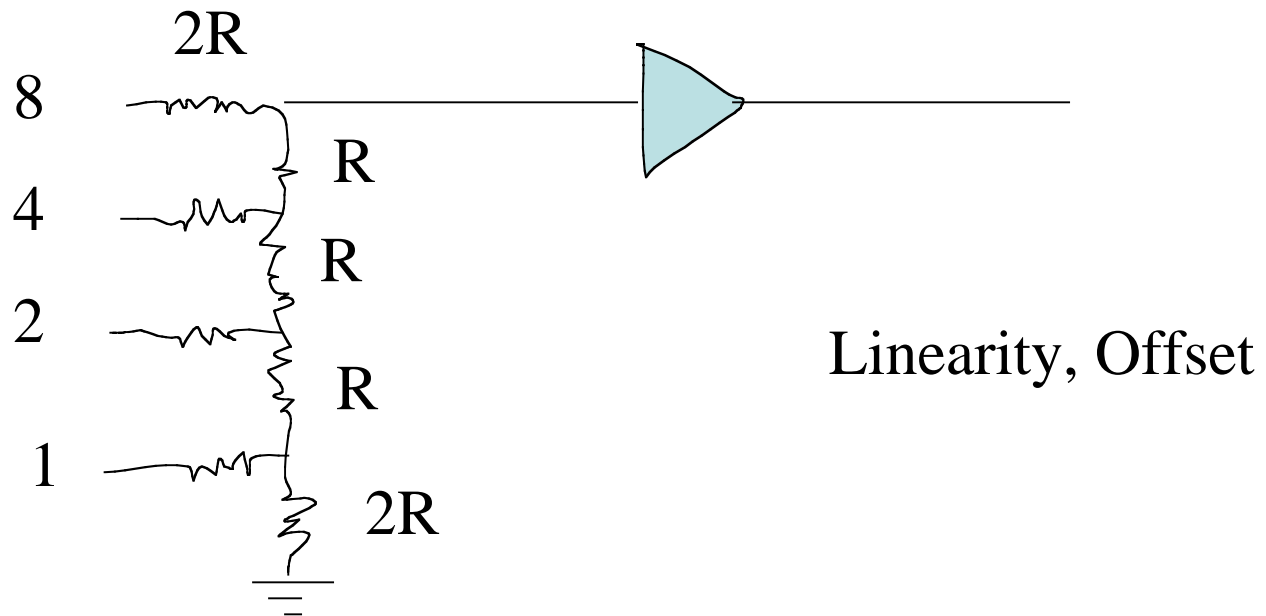


Solid-State Electronics-6

- Emerging strategy for physics instrumentation
- Keep everything digital as much as possible
- Use the internet for all intra-lab and inter-lab communications

Digital Strategy

- Requires A/D and D/A converters
- D/A converters use resistor networks



A/D Converters

- Several different strategies used for A/D converters
- “Flash encoders” use 2^n comparator circuits
- Slope A/D converter charges a capacitor and uses one comparator to sense when capacitor voltage equals input voltage. Counter gives digital output of capacitor charging time
- Time over threshold uses an RC circuit to integrate a pulse and measures pulse height by decay time

Instrument Communications

- Trend is towards using Internet Protocol (IP)
- IP is a packet-switching protocol
- Nodes have 4-byte (6-byte) IP addresses that are either static or dynamic
- IP addresses can be looked up using DNS (Domain Name Servers)

Instruments Communications

- Most common to use TCP rather than UDP on top of IP
- TCP is a client-server mode with ordered, checked and acknowledged communications
- TCP using sockets; server and client use sockets differently (Server: open, bind, accept); Client (open, bind, call). Sockets use IP addresses and ports

Ethernet

- Electrical implementation in lab is usually 10baseT or 100baseT ethernet
- Usual implementation is 2 twisted pairs with RJ45 connectors
- Ethernet is a master-less system with random timeout for re-send after collision
- Ethernet uses hubs, switches and routers