NC, CNC, DNC

Numerical control

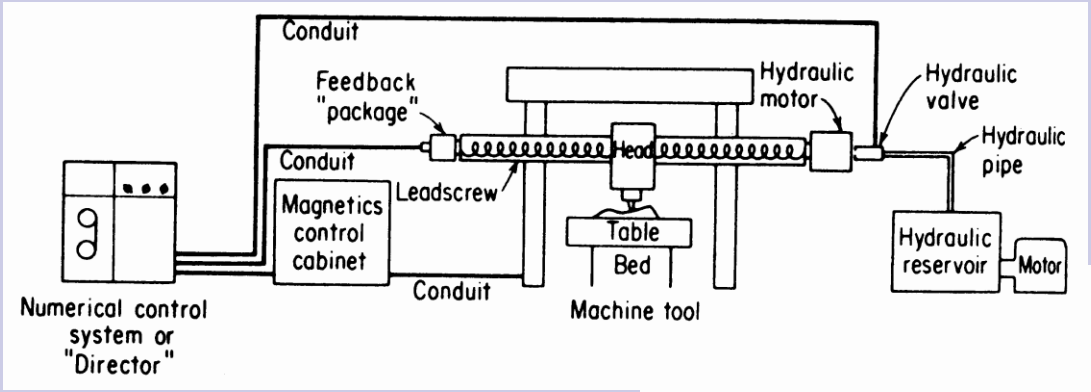
- Computer managed numerical control (NC) is a generic term that encompasses.
  - Computer numerical control (CNC),
  - Direct numerical control (DNC), and.
  - Industrial robots.
- Computer managed numerical control, integrated with an automated material handling and storage system, form the building blocks of the flexible manufacturing system (FMS).

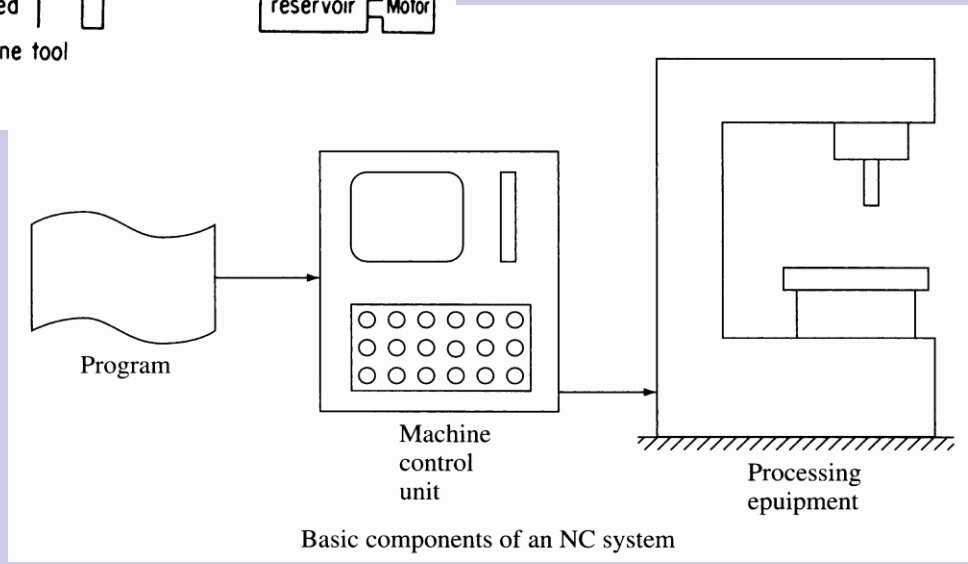
Numerical control

- Numerical control (NC) is a form of flexible (programmable) automation in which the process is controlled by numbers, letters, and symbols.
- The electronic industries association (EIA) defined NC as
  - “A system in which actions are controlled by the direct insertion of numerical data at some point. The system must automatically interpret at least some portion of this data.”

Basic Components

- An NC system consists of the machine tools, the part-program, and the machine control unit





Basic components of an NC system

The EIA definition of computer numerical control (CNC)

- A numerical control system wherein a dedicated, stored program computer is used to perform some or all of the basic numerical control functions in accordance with control programs stored in the read-write memory of the computer.

CNC

- CNC supports programming features not available in conventional NC systems:
  - Subroutine macros which can be stored in memory and called by the part-program to execute frequently-used cutting sequence.
  - Inch-metric conversions, sophisticated interpolation functions (such as cubic interpolation) can be easily accomplished in CNC.
  - Absolute or incremental positioning (the coordinate systems used in locating the tool relative to the work piece) as well as PTP or contouring mode can be selected.

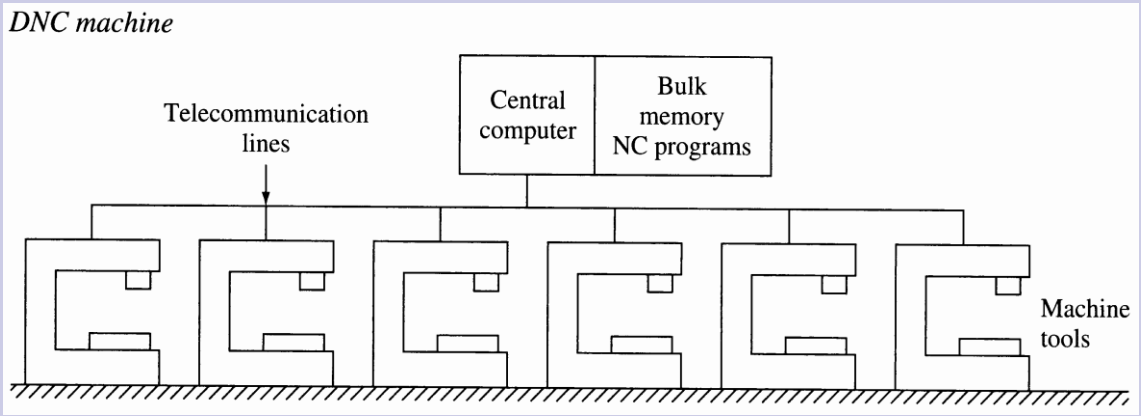
- The part-program can be edited (correction or optimization of tool path, speeds, and feeds) at the machine site during tape tryout.
- Tool and fixture offsets can be computed and stored.
- Tool path can be verified using graphic display.
- Diagnostics are available to assist maintenance and repair.

Direct Numerical Control (DNC)

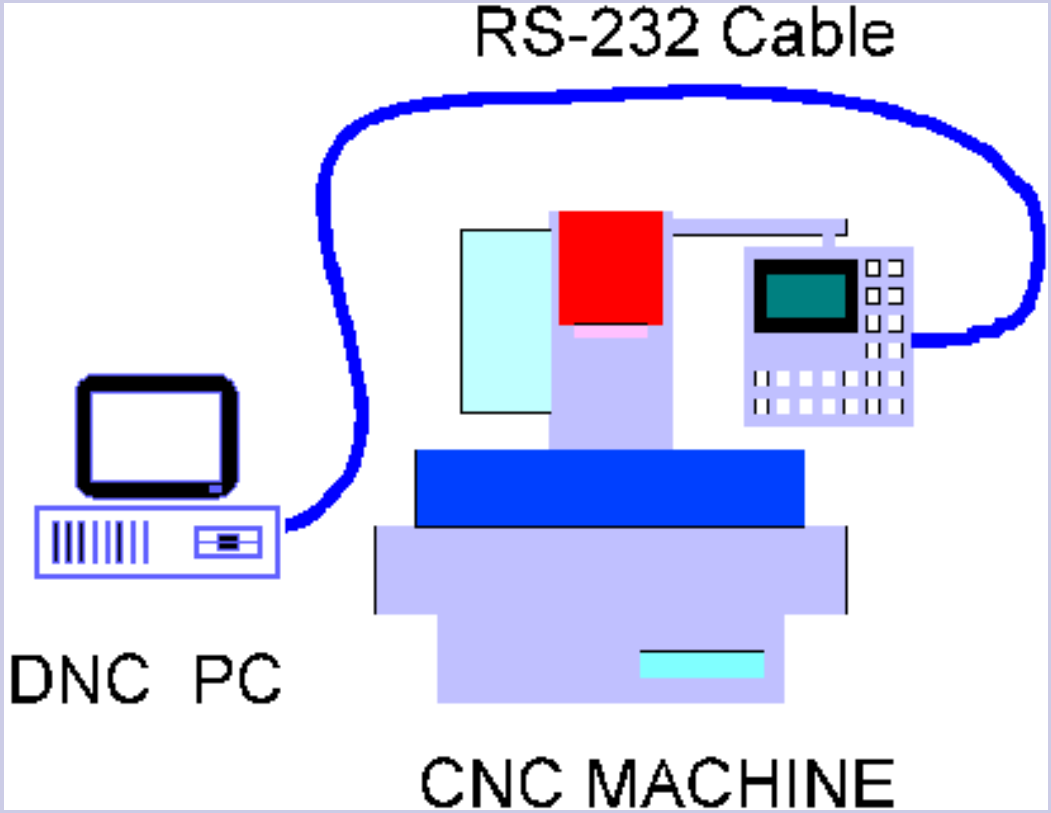
The EIA definition of DNC

"A system connecting a set of numerically controlled machines to a common memory for part program or machine program storage with provision for on-demand distribution of data to machines."

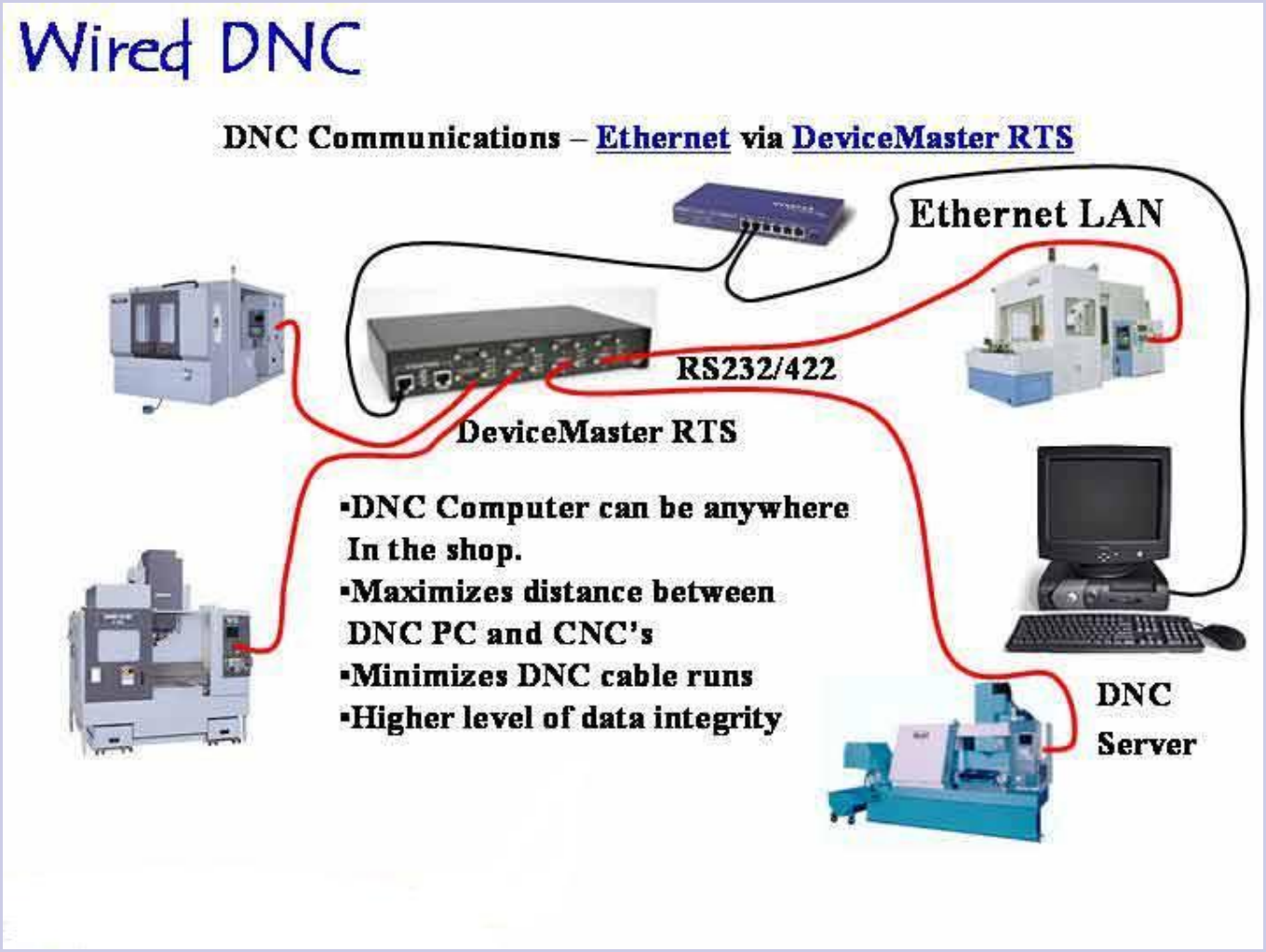
- In DNC, several NC machines are directly controlled by a computer, eliminating substantial hardware from the individual controller of each machine tool. The part-program is downloaded to the machines directly (thus omitting the tape reader) from the computer memory.



Minimal configuration of DNC



DNC


Wired DNC
DNC Communications – Ethernet via DeviceMaster RTS
Ethernet LAN
RS232/422
DeviceMaster RTS
•DNC Computer can be anywhere In the shop.
•Maximizes distance between DNC PC and CNC's
•Minimizes DNC cable runs
•Higher level of data integrity
DNC Server