School of Computer Science

Winter Term 2000

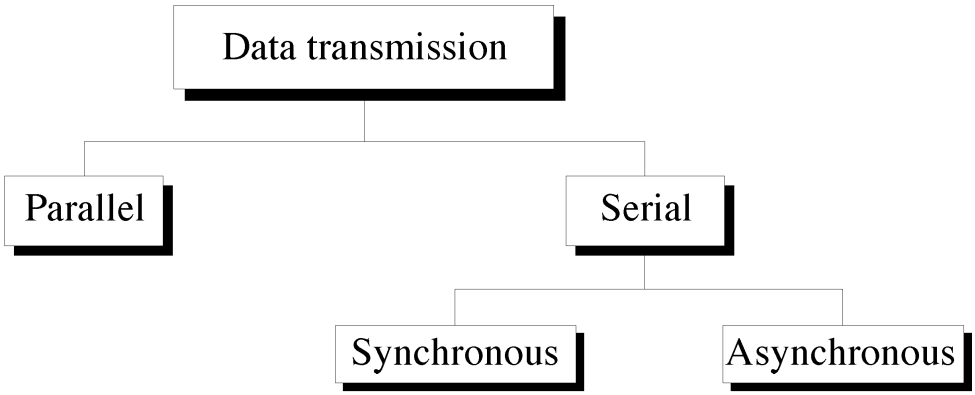
CS 308-435
Basics of Computer Networks

Hans Vangheluwe

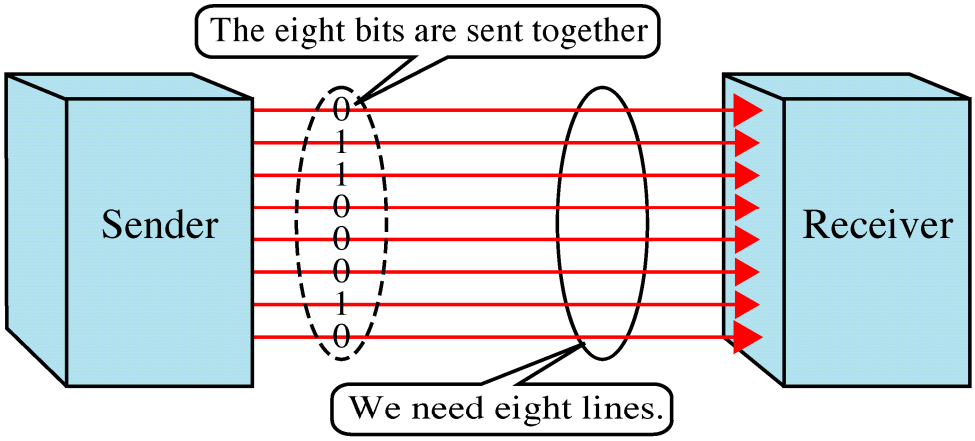
Transmission of Digital Data

- interfaces
- modems

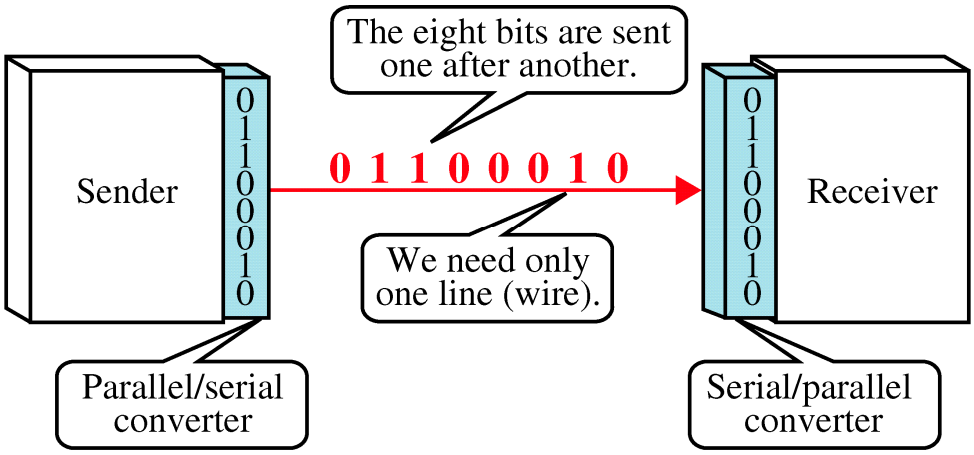
Digital Data Transmission



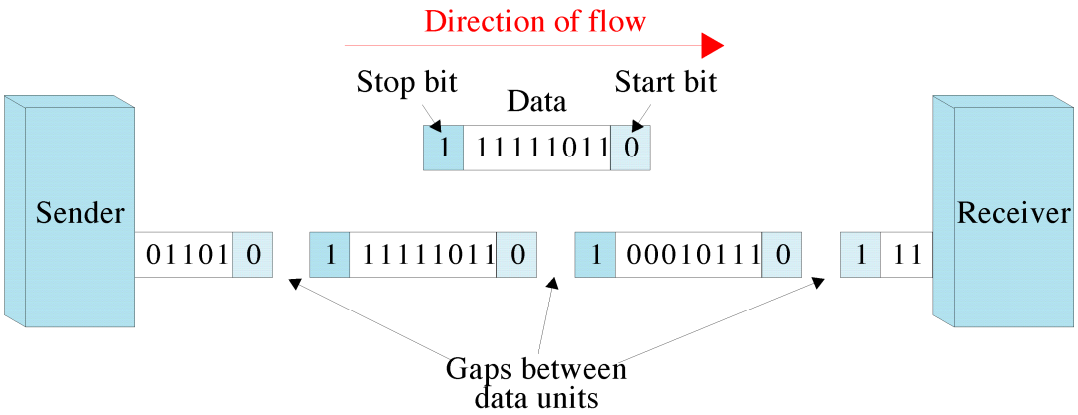
Parallel



Serial



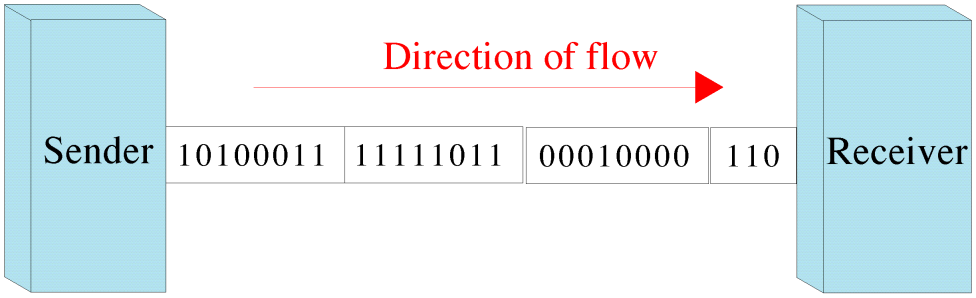
Asynchronous



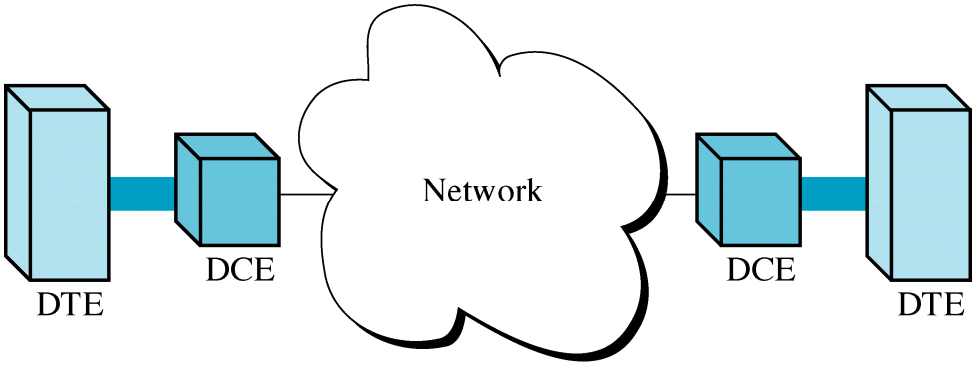
Asynchronous

- byte + start bit + one or more stop bits
- idle or stop bits in between
- synchronized *in* byte
- slow, but no control (synch info) needed
- terminal-computer

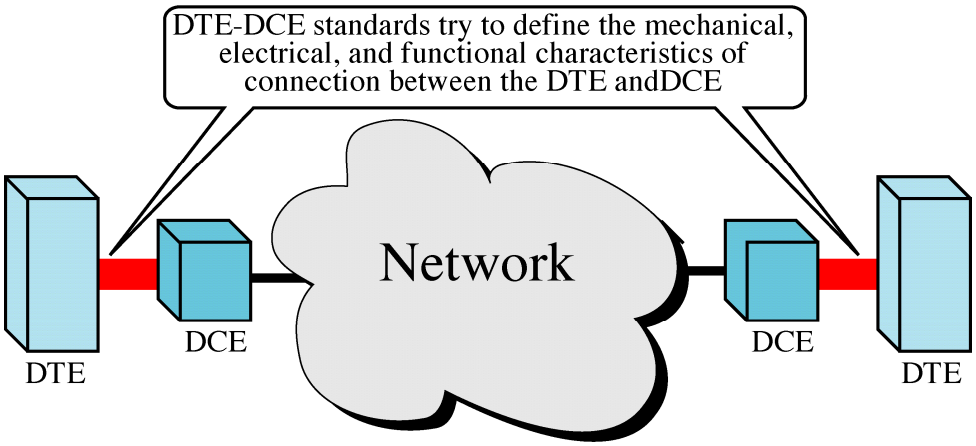
Synchronous
(synch at Data Link layer)



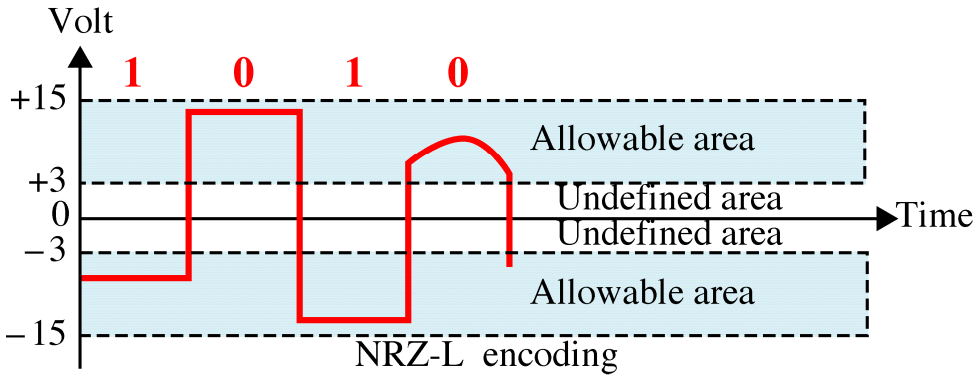
Data Terminal Equipment
Data Circuit-Terminating Equipment



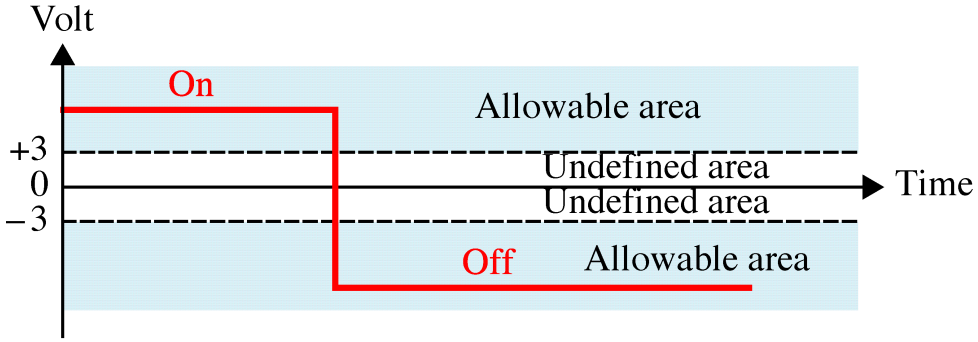
DTE-DCE Interface



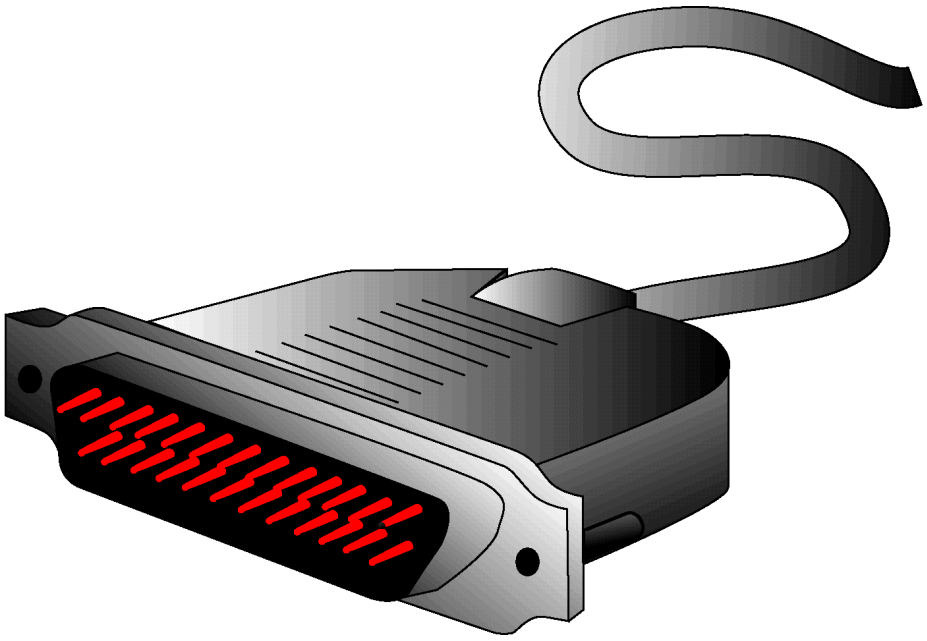
Electrical Specifications EIA-232 (Electronic Industries Association)



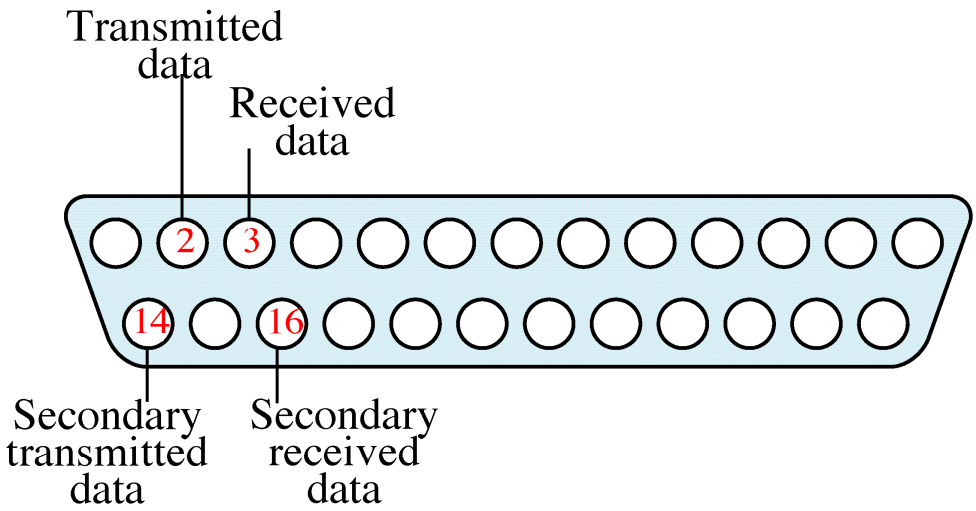
Control Signals

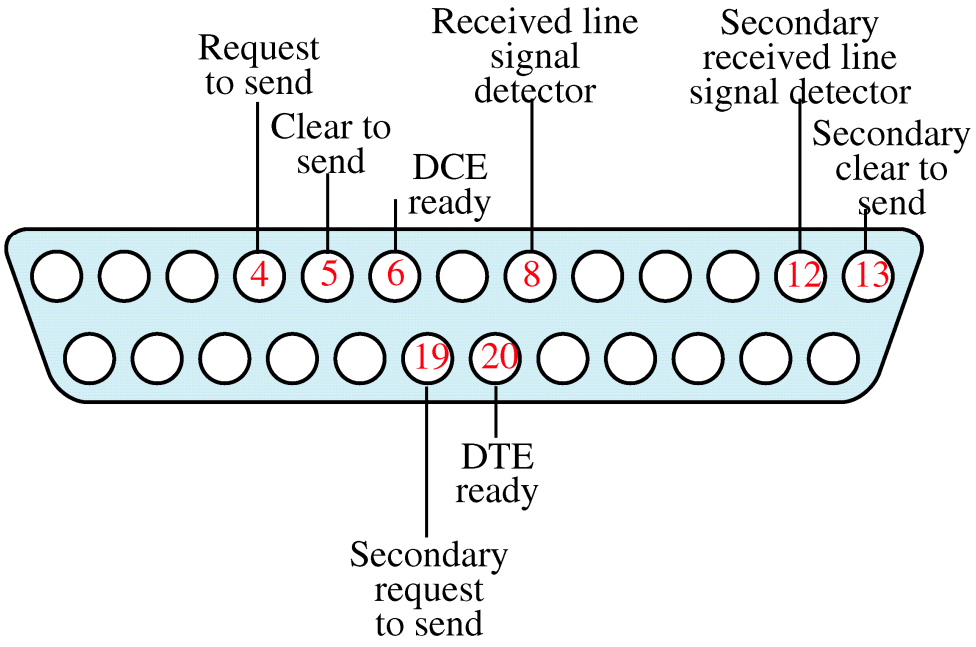


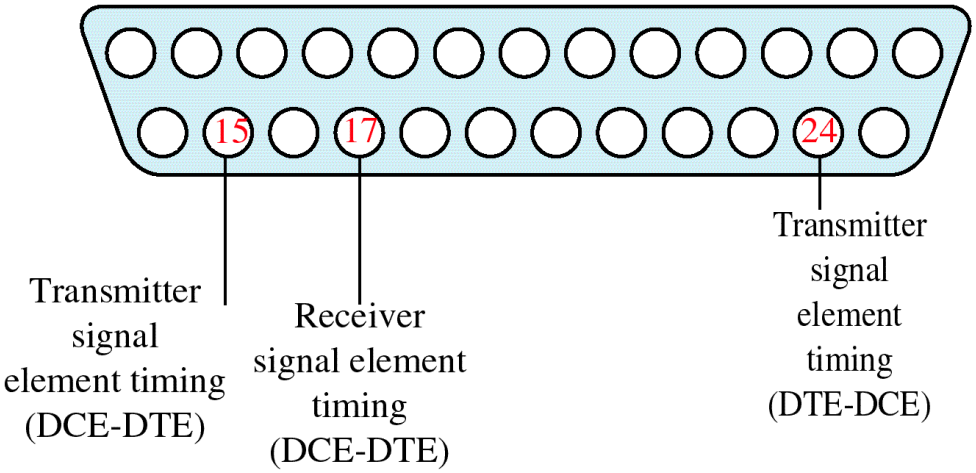
DB25

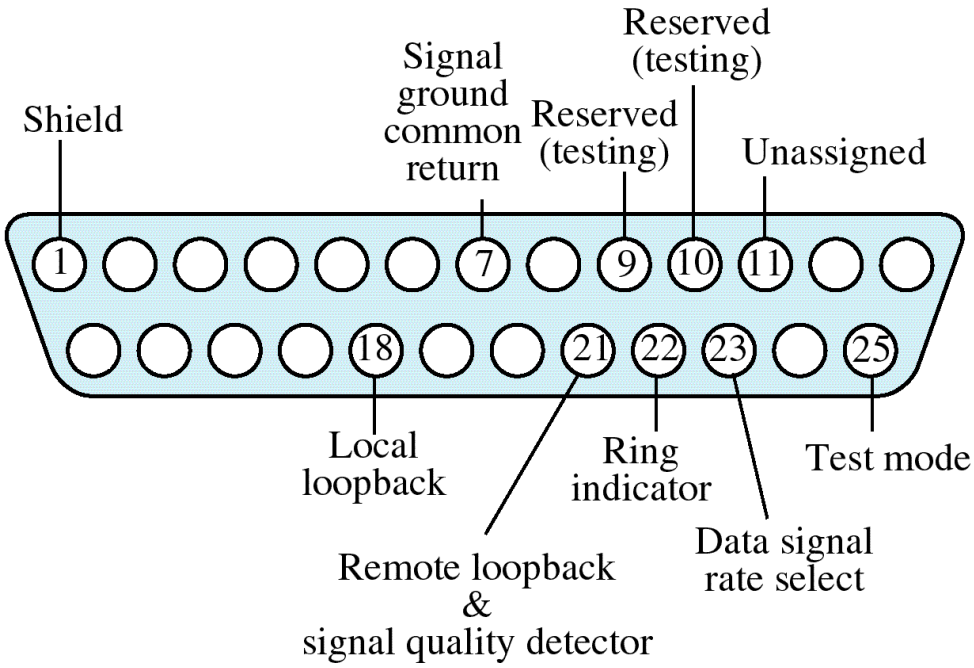


EIA-232 (formerly RS-232), DB25

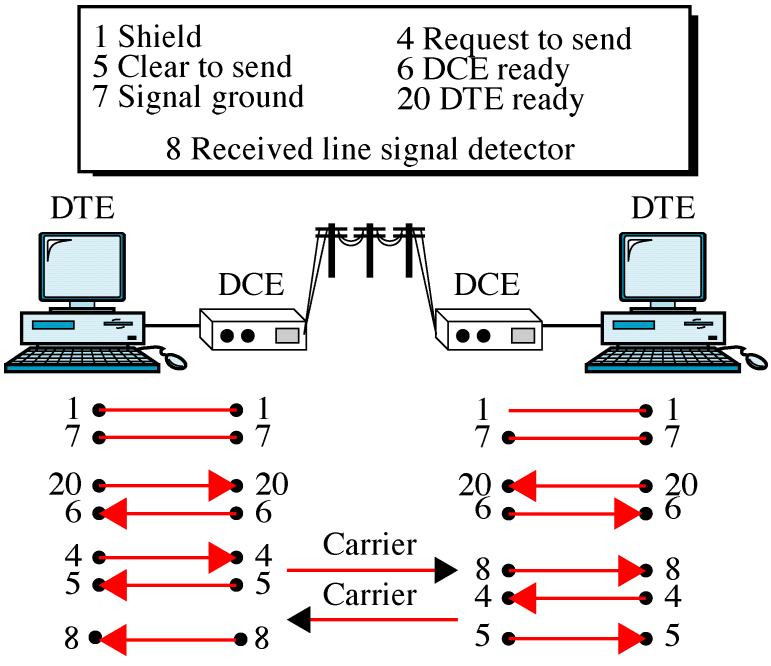


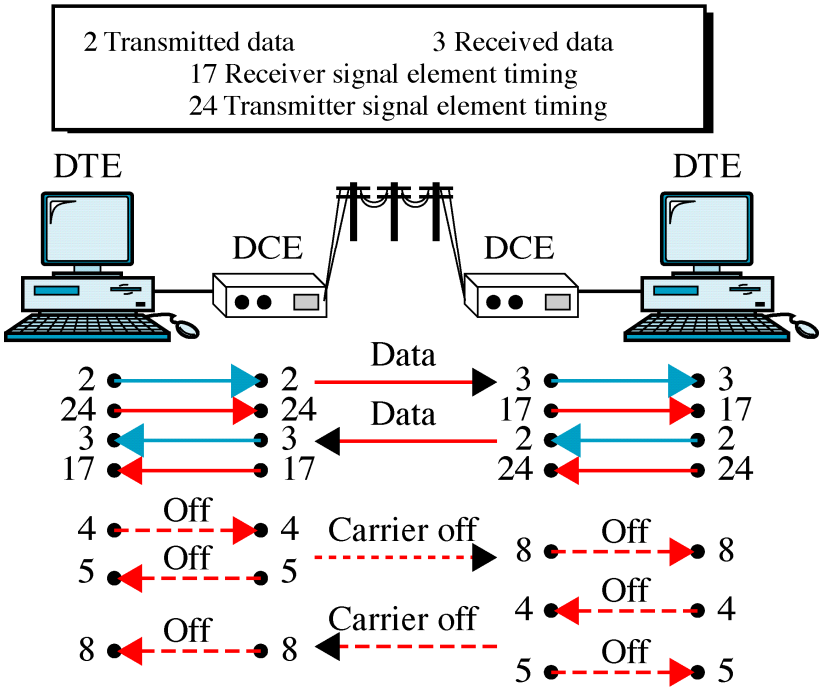

Request to send
Clear to send
DCE ready
Received line signal detector
Secondary received line signal detector
Secondary clear to send
4
5
6
8
12
13
19
20
DTE ready
Secondary request to send


15
17
24
Transmitter signal element timing (DCE-DTE)
Receiver signal element timing (DCE-DTE)
Transmitter signal element timing (DTE-DCE)

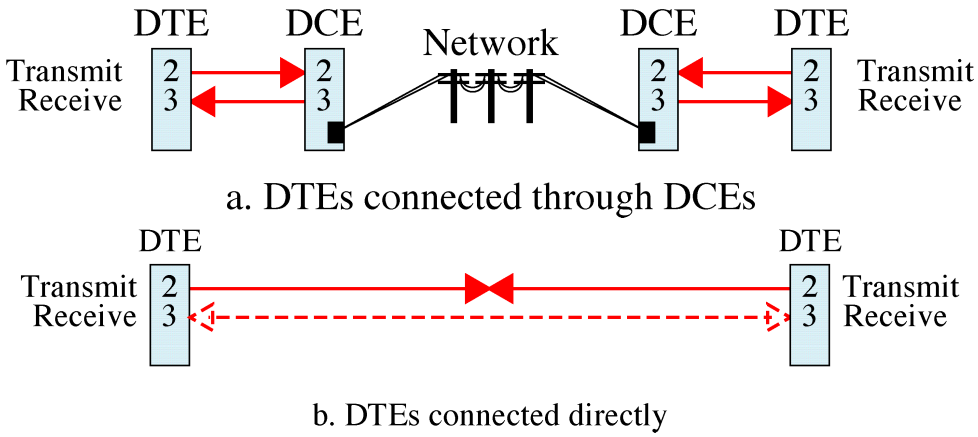


Synchronous Full Duplex





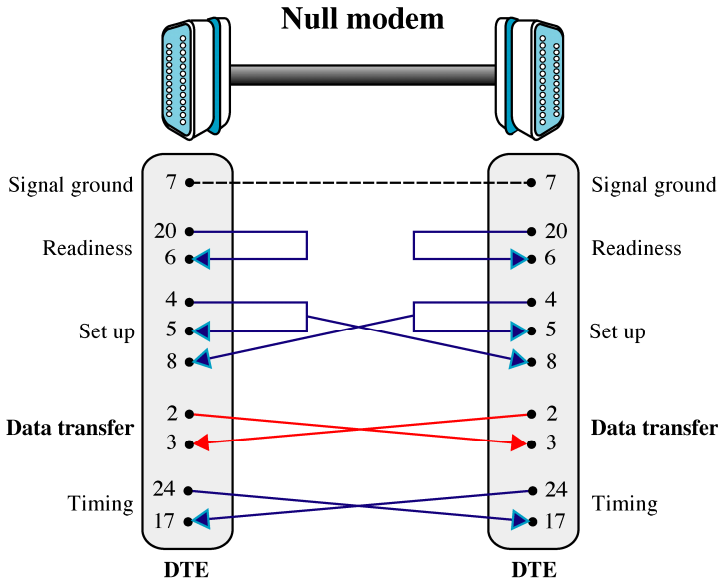
No DCEs



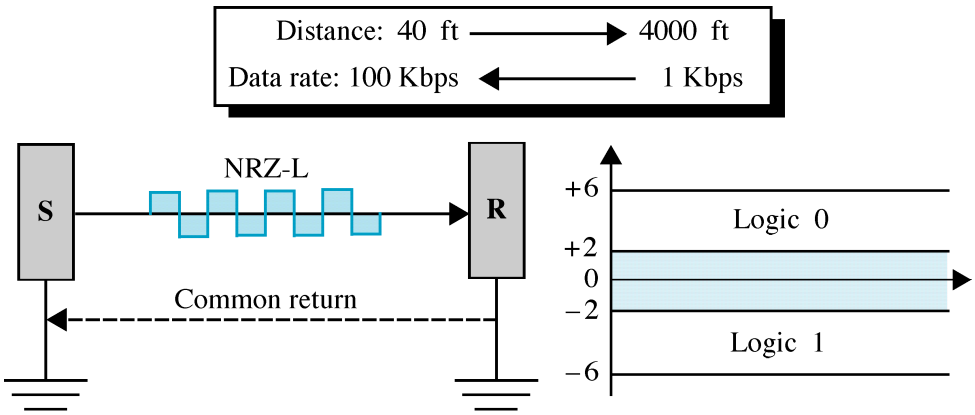
a. DTEs connected through DCEs

b. DTEs connected directly

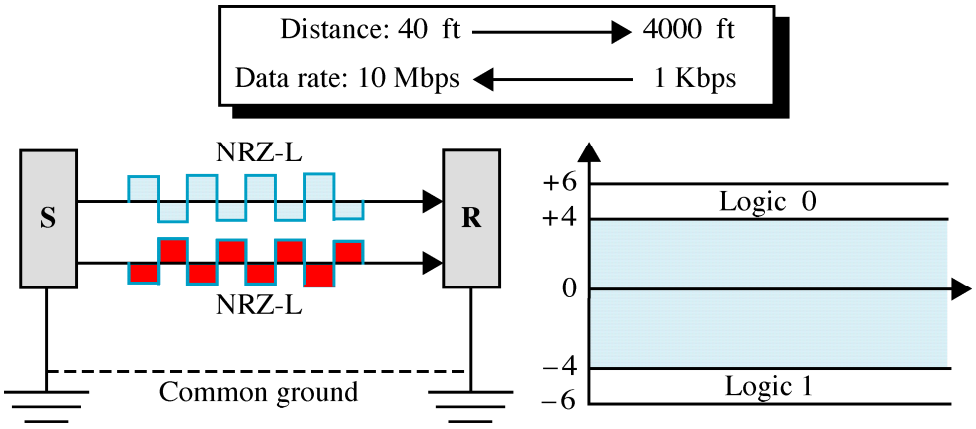
Null Modem cable for Direct Connection



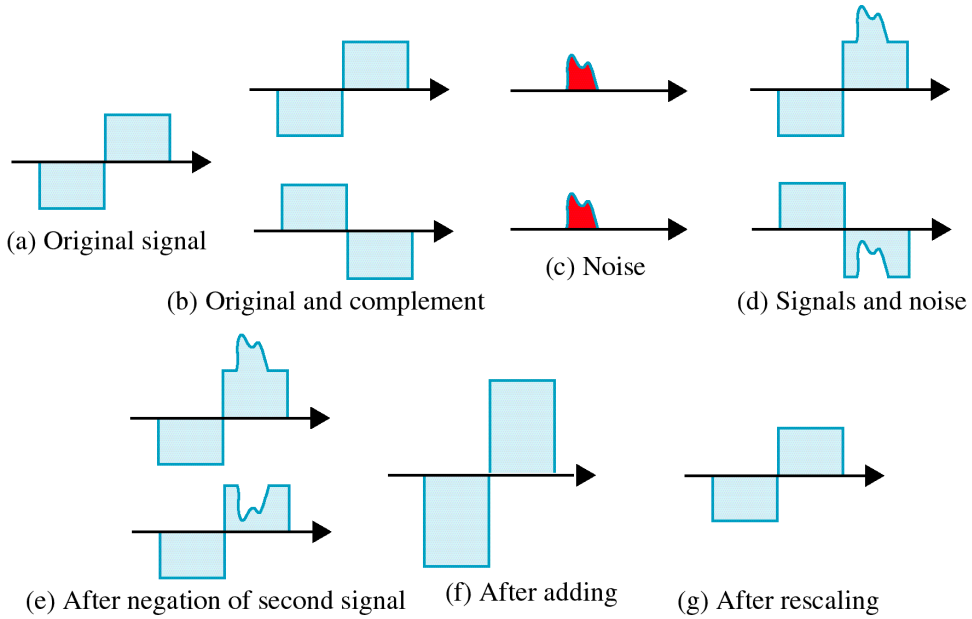
RS423: Unbalanced Mode



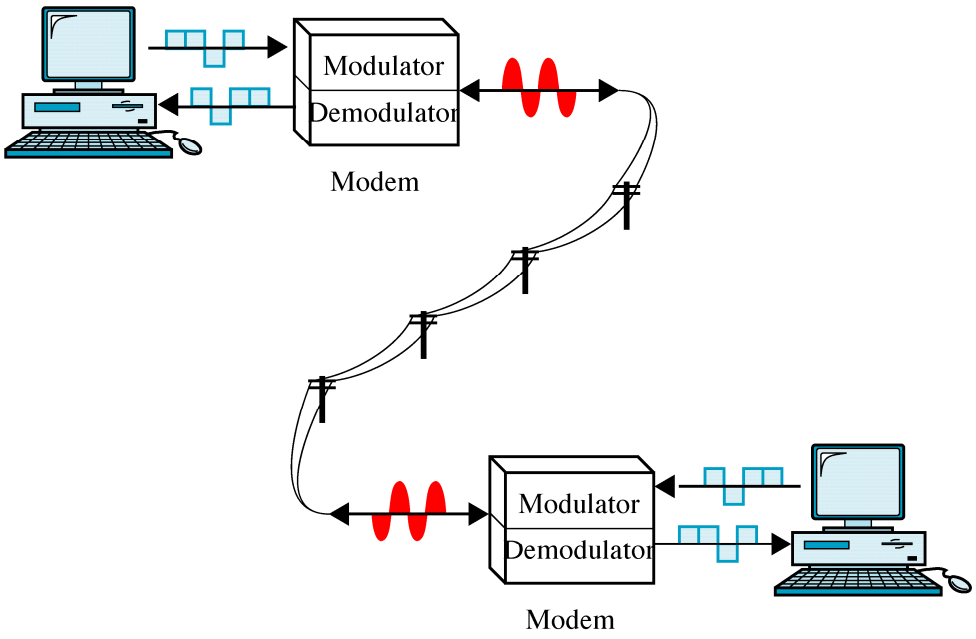
RS423: Balanced Mode



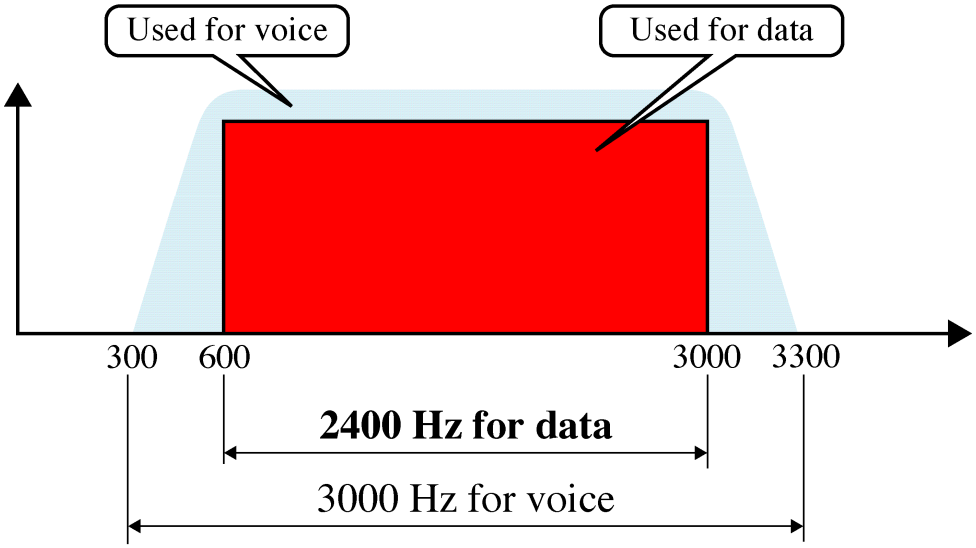
Noise Cancellation (signal x2)



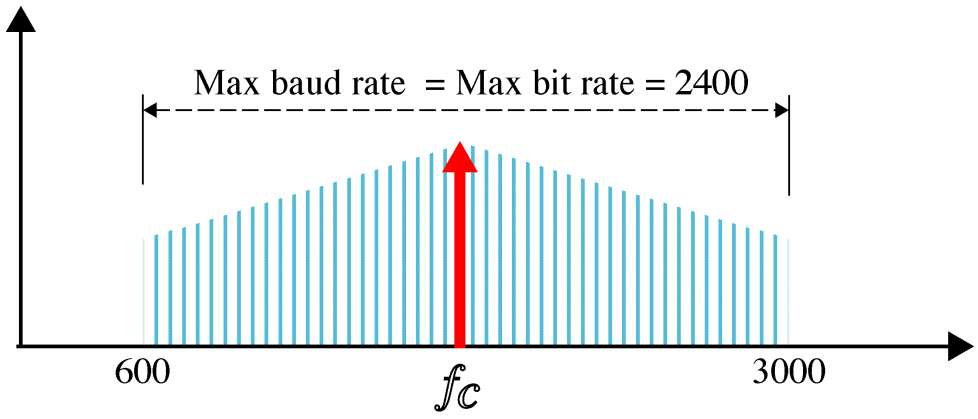
MoDem



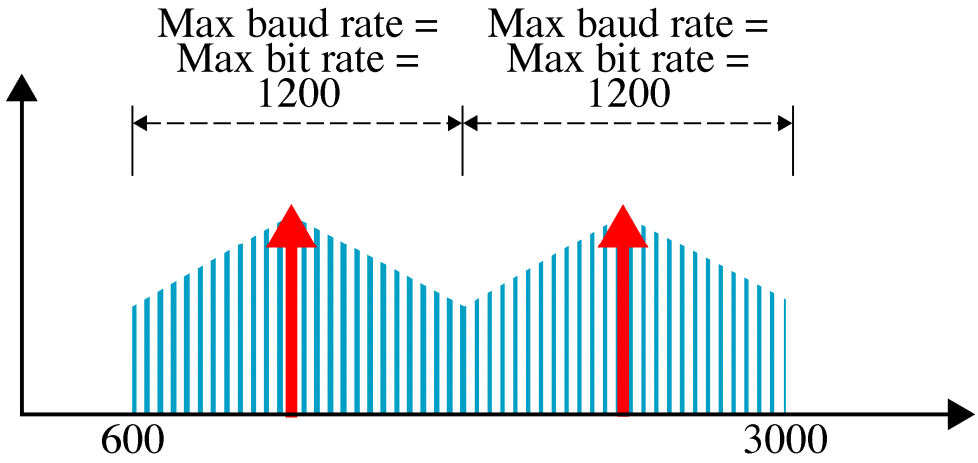
Telephone Line Bandwidth



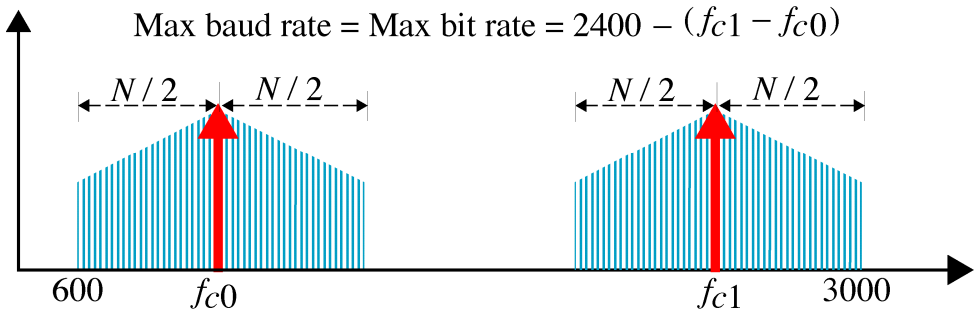
Baud rate in Half Duplex ASK



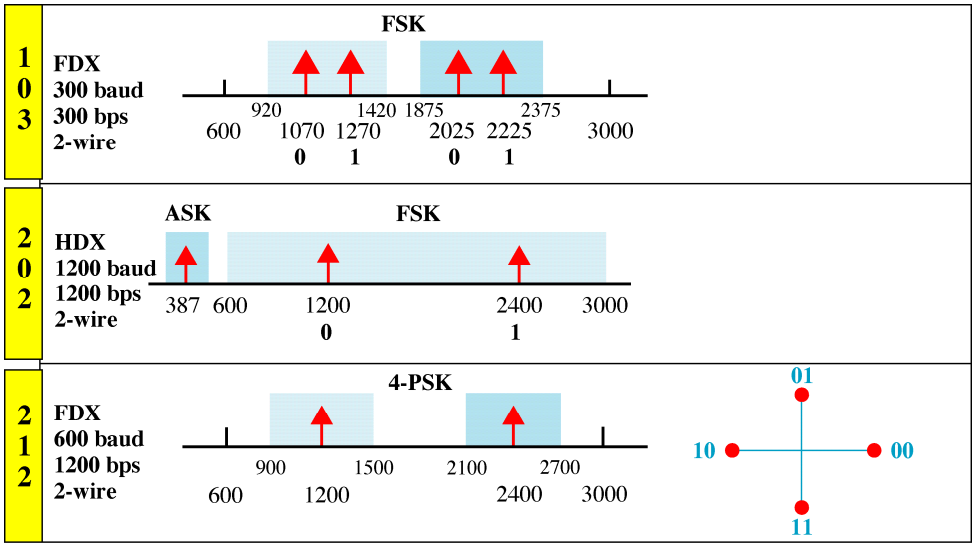
Baud rate in Full Duplex ASK



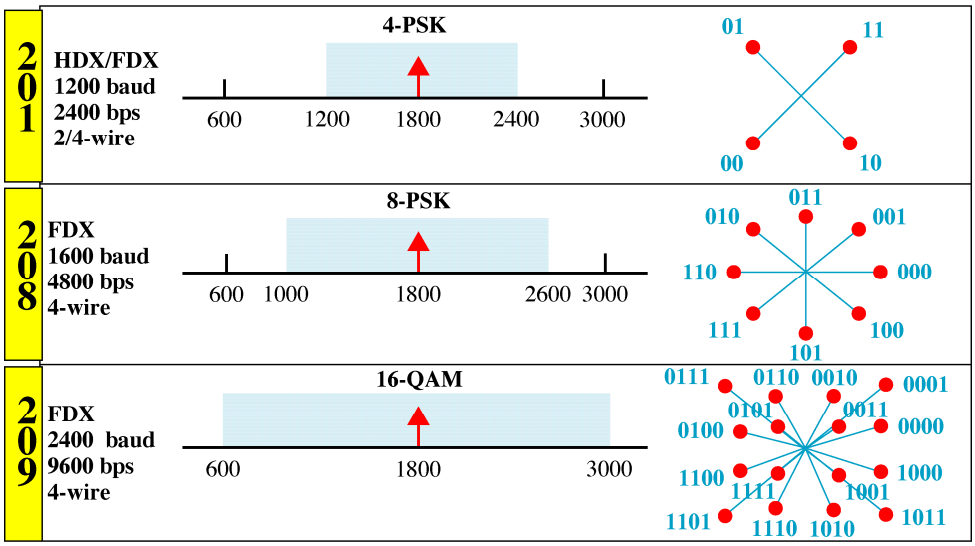
Baud rate in Half Duplex FSK



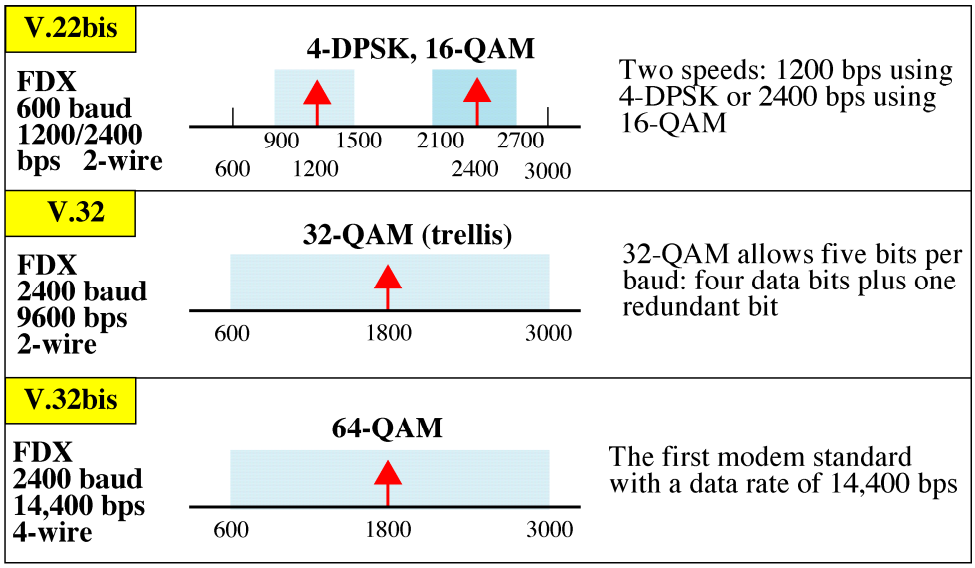
Bell Modems



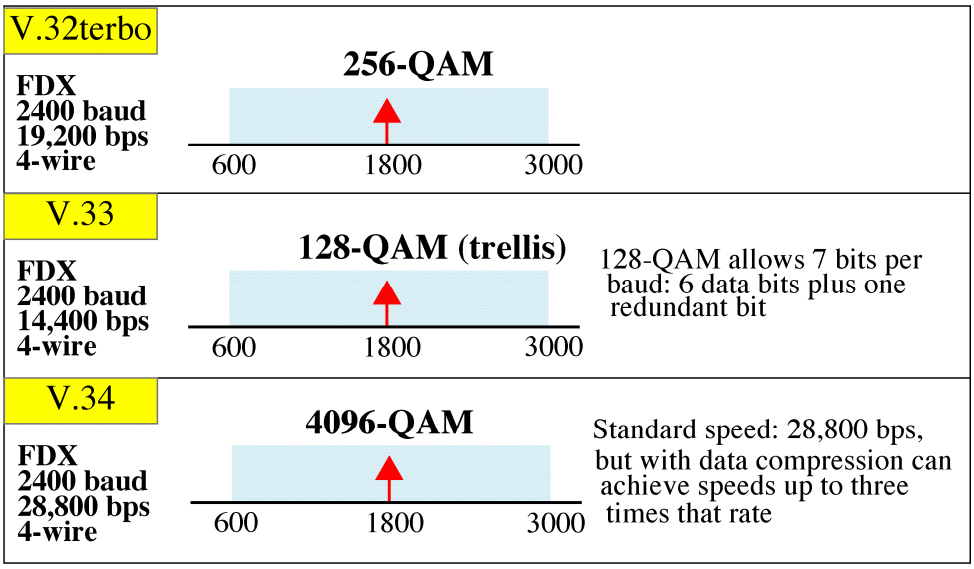
Bell Modems



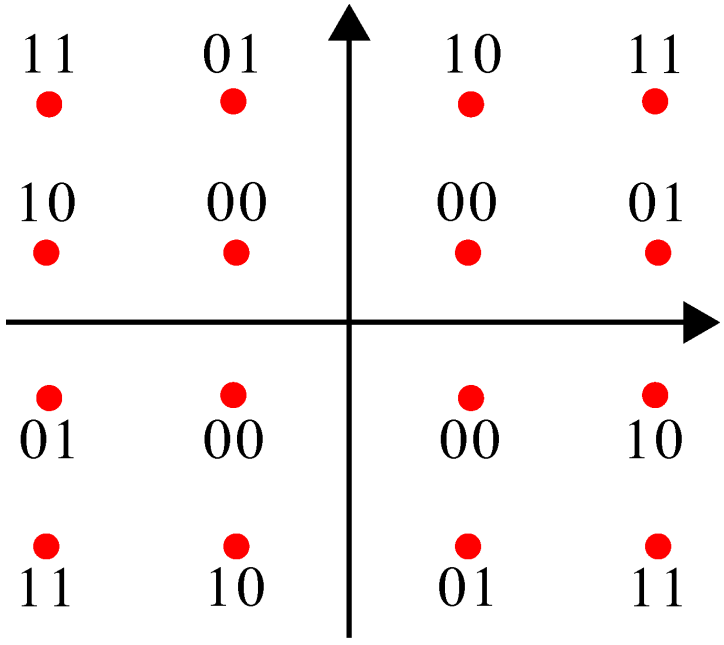
ITU-T Modems



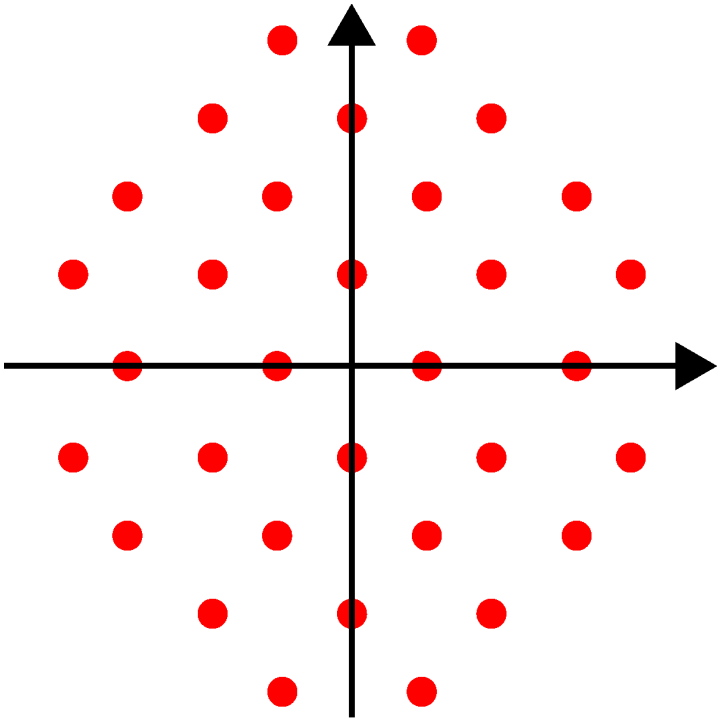
ITU-T Modems



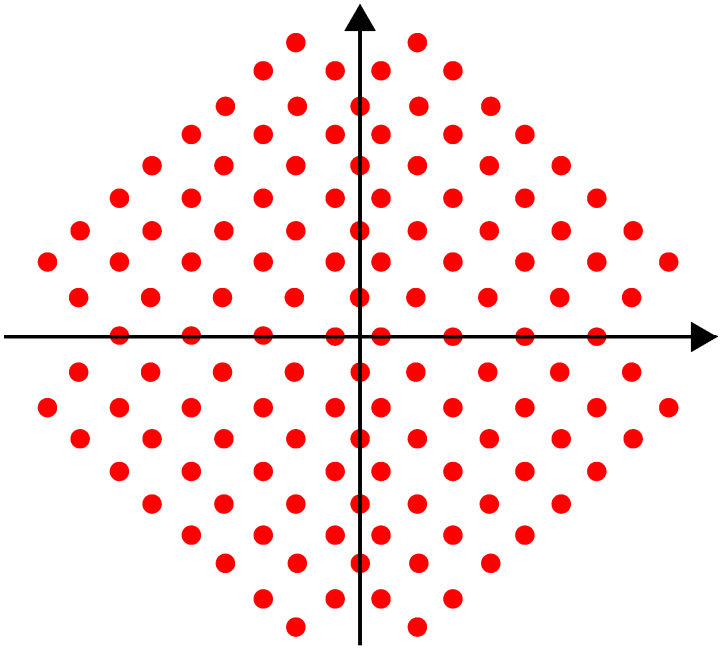
V.22bis 16-QAM Constellation



V.32 Constellation



V.33 Constellation



56K Modems