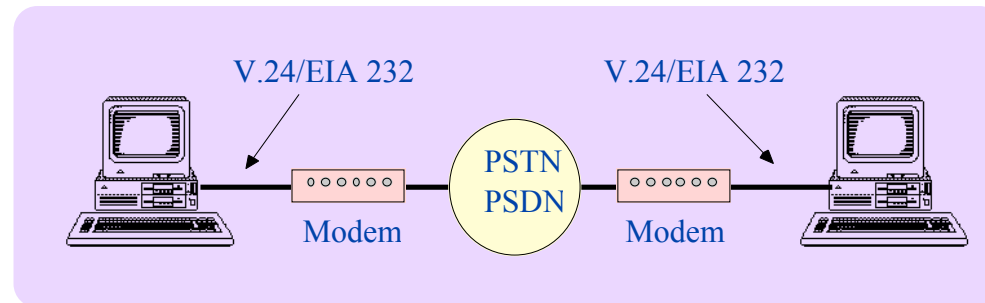


## Physical Layer Interface Standards (PSTN)

- **EIA RS-232-C/D**

- ◇ The most commonly found interface
- ◇ Intended to join Terminal and computer to modem
- ◇ Also used to join terminal to computer and computer to computer
- ◇ Terminal = Data Terminal Equipment (DTE)
- ◇ Computer = DTE
- ◇ Modem = Data Circuit-terminating Equipment (DCE)



- ◇ Voltage +3 -> +15V logic 0
- ◇ Voltage -3 -> -15V logic 1
- ◇ Unbalanced system
- ◇ < 20kbps
- ◇ < 15m

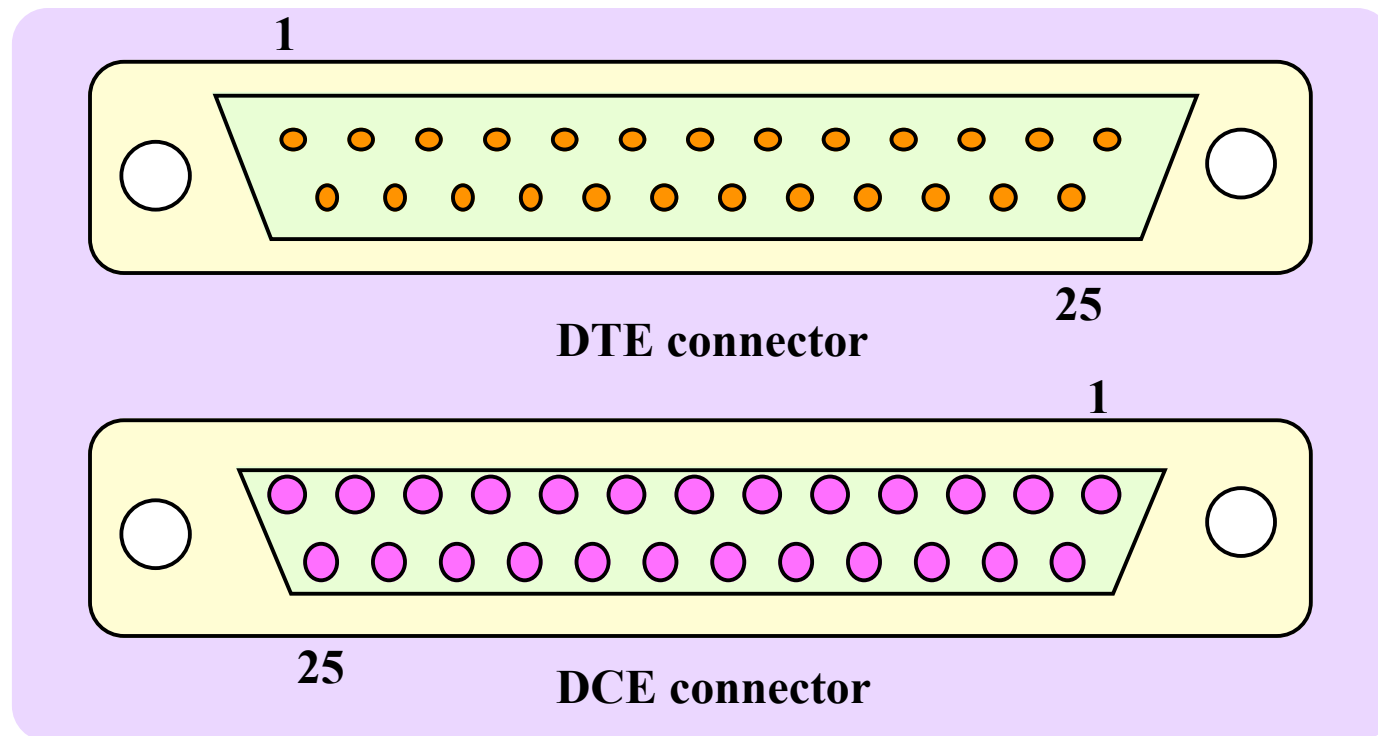
## Line designation

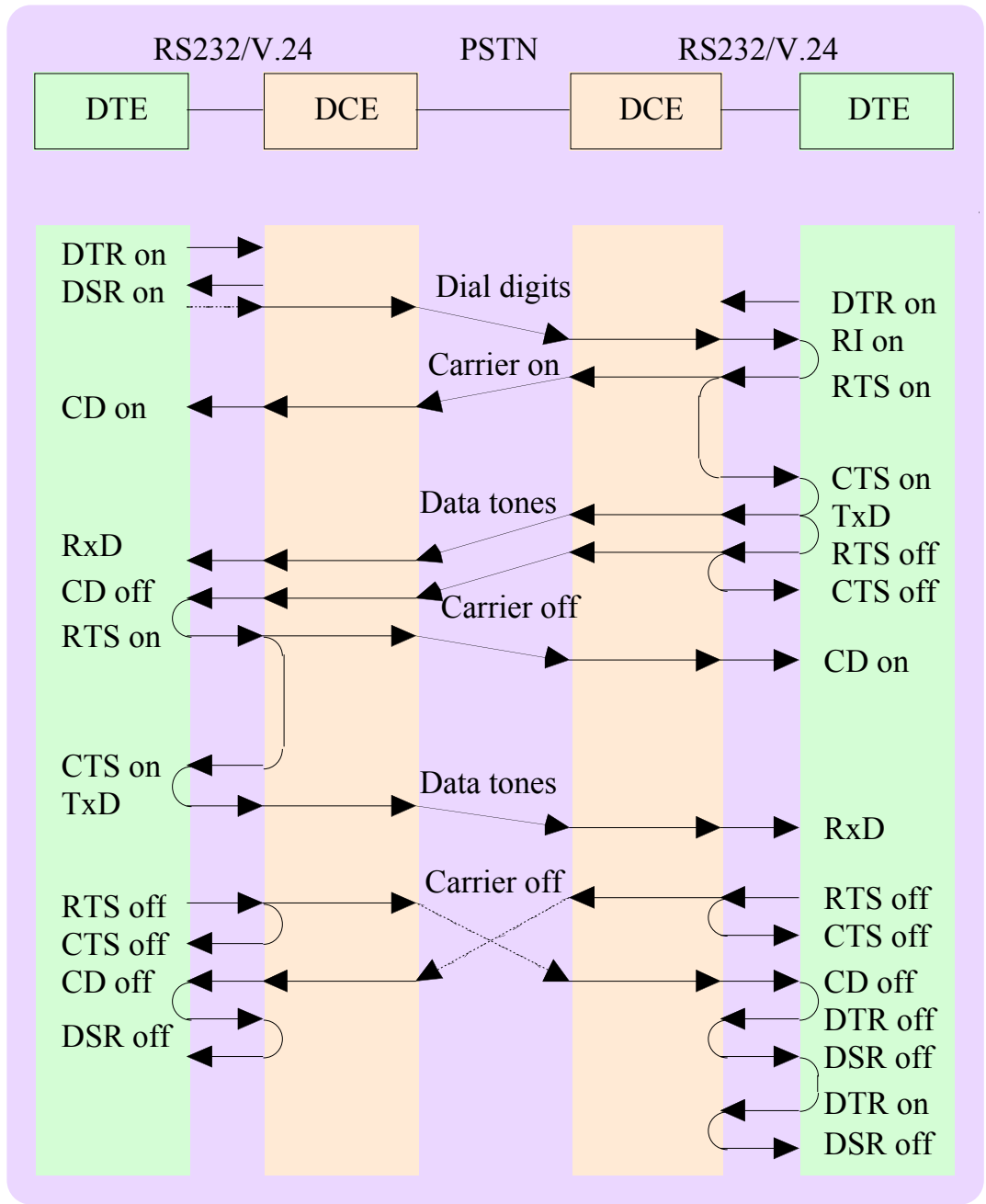
CCITT circuit	Pin		
125 RI	22	←	Ring Indication RI
108 DTR	20	→	Data Terminal Ready DTR
111 TxClk	16	→	Transmit Data Timing DTE Source
114 TxClk	15	←	Transmit Data Timing DCE Source
115 RxClk	17	←	Receive Data Timing
109 CD	8	←	Carrier Detect CD
102 SIG	7	—	Signal Ground SIG
107 DSR	6	←	Data Set Ready DSR
106 CTS	5	←	Clear To Send CTS
105 RTS	4	→	Request To Send RTS
104 RxD	3	←	Receive Data RxD
103 TxD	2	→	Transmit Data TxD
101 SHG	1	—	Shield Ground SHG

◇ RS-232-D (1987) defines extra signals for loopback testing

## Connector designation

- ◇ Under RS-232-C a number of connector may be used the most common being the DB25 (ISO 2110)
- ◇ RS-232-D specifies this connector only





- V.24

- ◇ Defined by CCITT
- ◇ RS-232 basically compatible with V.24
- ◇ Most apparent difference is pin or circuit identifiers
- ◇ Use CCITT circuit numbers

- V.28

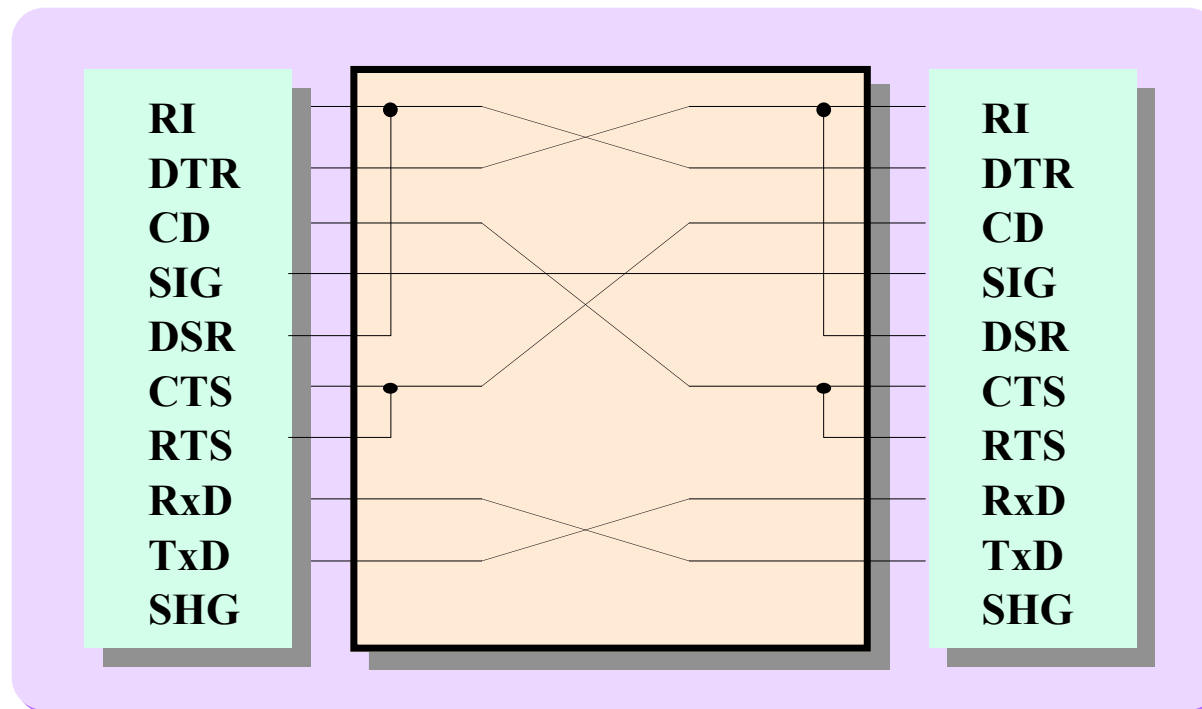
- ◇ Same as RS-232C except has faster rise and fall times

In summary the RS-232D standard is

Electrical	CCITT V.28
Functional	CCITT V.24
Mechanical	ISO 2110
Procedural	CCITT V.24

- **The Null modem**

- ◇ Often wish to connect two DTE's together directly
- ◇ Terminal -> computer
- ◇ Computer -> printer etc
- ◇ V.24 or RS-232 data circuits must be reversed
- ◇ Control circuits must be fooled



- RS-423-A

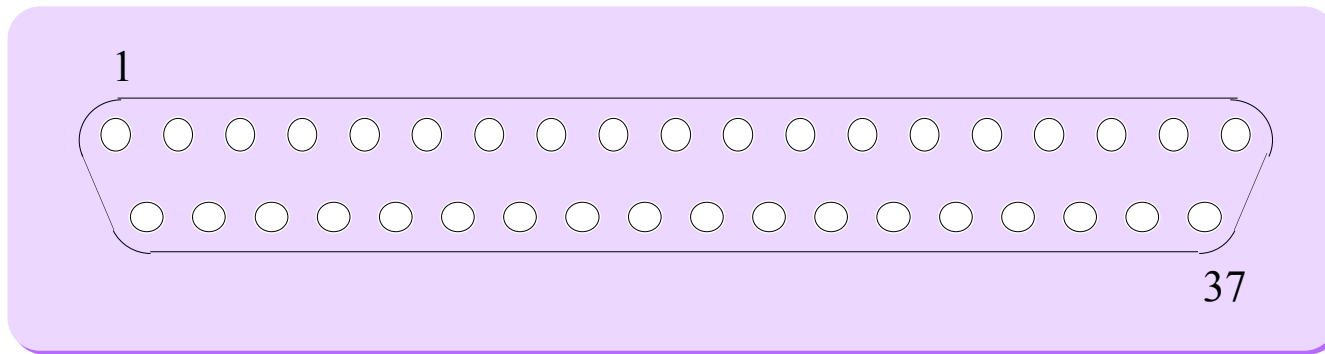
- ◇ An electrical standard
- ◇ Unbalanced line
- ◇ NRZ L
- ◇ 0 = +2 to +6 volts
- ◇ 1 = -2 to -6 volts
- ◇ 3kbps @ 1000m
- ◇ 300kbps @ 10m
- ◇ Compatible with V.10, X26

- RS-422-A

- ◇ Balanced line
- ◇ NRZ L
- ◇ 0 = +2 to +6 volts
- ◇ 1 = -2 to -6 volts
- ◇ 100kbps @ 1200m
- ◇ 10Mbps @ 12m
- ◇ Compatible with X.27, V.11
- ◇ Multidrop as RS-485

- RS-449

- ◇ Intended to replace RS-232
- ◇ Uses RS-422 and RS-423 electrical standards
- ◇ Specified up to 2Mbps
- ◇ 37 circuits (large footprint)
- ◇ ISO 4902 connector
- ◇ Not popular





- EIA-530

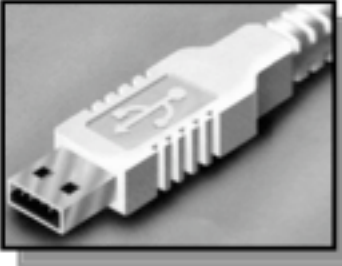

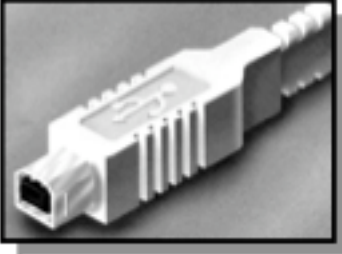

- ◇ Uses RS-422 and RS-423
- ◇ 20kbps to 2Mbps
- ◇ 25 circuits almost identical to RS-232-D
- ◇ DB-25 connector (ISO 2110)
- ◇ 422 for signalling
- ◇ 423 for loopback and test signals

- V.35

- ◇ Intended for high speed connection between high speed wideband modems and a DTE
- ◇ 34 pin connector
- ◇ 48 - 168 kbps
- ◇ Signalling circuits RS-422
- ◇ Control circuits RS-232
- ◇ Can run over long distance when only using signal lines
- ◇ Normally associated with V.35 modem (48000 bps)

These are a few of the interfaces used to access PSTN lines via modems. Many more specialised interfaces exist. See some later.

## USB (Universal Serial Bus)

Series "A" Connectors	Series "B" Connectors
<p data-bbox="504 320 996 454">◆ Series "A" plugs are always oriented <b>upstream</b> towards the <i>Host System</i></p>  <p data-bbox="884 544 1064 662"><b>"A" Plugs</b> (From the USB Device)</p> <p data-bbox="488 858 795 1018"><b>"A" Receptacles</b> (Downstream Output from the USB Host or Hub)</p> 	<p data-bbox="1153 320 1646 502">◆ Series "B" plugs are always oriented <b>downstream</b> towards the <i>USB Device</i></p>  <p data-bbox="1556 603 1736 721"><b>"B" Plugs</b> (From the Host System)</p> <p data-bbox="1164 922 1489 1040"><b>"B" Receptacles</b> (Upstream Input to the USB Device or Hub)</p> 

USB Specification Rev 2

USB2 480, 12 and 1.5 Mb/s  
See maxwell for full specification

## Overview

