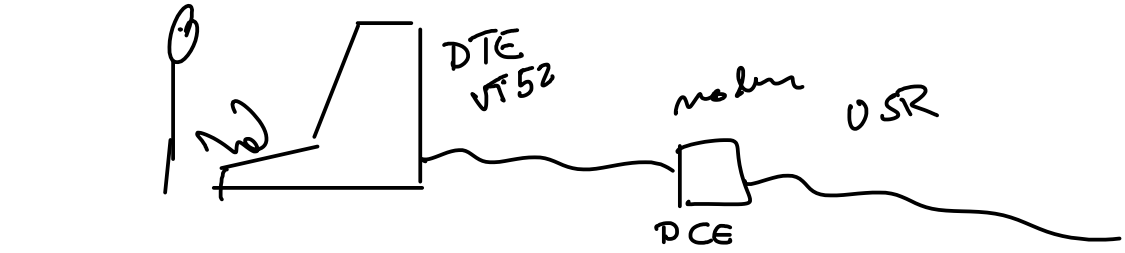
Lecture 4 - Serial Interfaces

Exercise 1: Is the "Transmit Data" (TxD) signal an input or an output? How about "Receive Data" (RxD)? Is a computer a 'modem' or a 'terminal'?

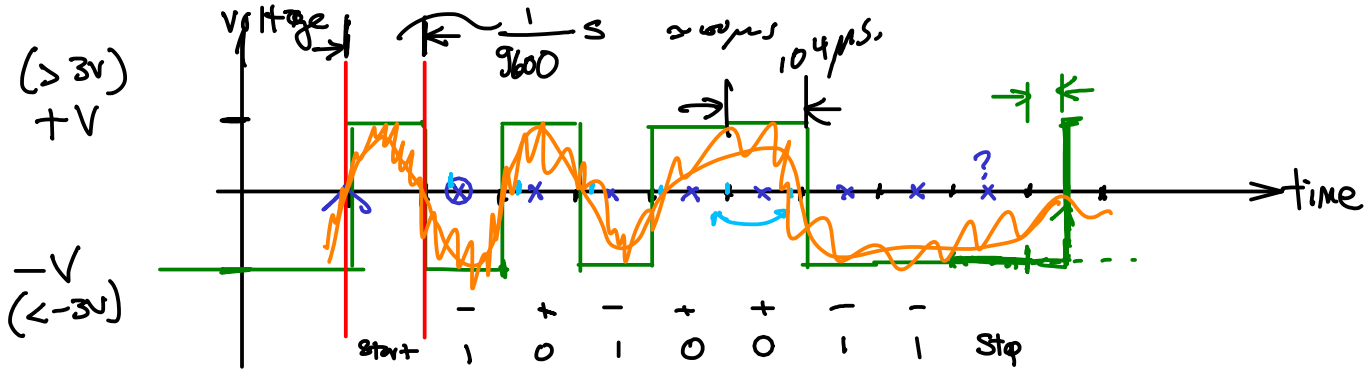
TxD is an input on a DCE (modem)
output on a DTE

RxD is input on DTE
output on DCE

PC are typically DTE
(minicomputer might be a DCE).



Exercise 2: Draw the waveform used to send the ASCII character 'e' (hex 65) at 9600 bps with seven data bits and no parity.



'e' = 0x65 = 0110 0101 (MS to LS)

= 1010 011 (LS to MS, 7 bits)

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Exercise 3: Will the parity bit allow the receiver to detect all single-bit errors? All double-bit errors?

all single bit errors → yes.
any single bit error will change parity from even to odd or v-v.

all double-bit errors → no
two inversions of parity result in same parity
e.g. even → (1st error) odd → (2nd error) even

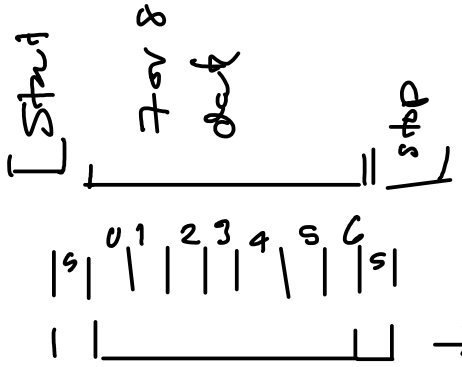
P_e = prob. of 1 error
$(P_e)^2$ = prob of 2 errors
$(P_e)^3$ = 3

e.g. 1%
10^{-4}
10^{-6}

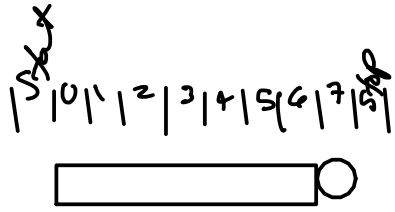
Exercise 4: What happens if the receiver's clock is running faster than the transmitter clock?

- receiver will sample too early
- potentially may sample some bits twice

Exercise 5: What would happen if the receiver was expecting 8-bit characters and the transmitter was sending 7-bit characters? What about the reverse case?



→ receiver "picks up" the stop bit as the MS data bit & it is Low = '1'



if MS. bit was low (1) then it treated as extra stop bit

→ if MS bit was 0 (hi) receiver could notice wrong level for stop bit & decleres a "framing" error.