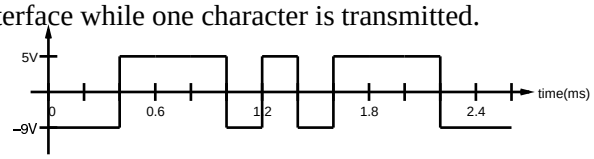
Assignment 9 - Serial and Parallel Interfaces

due Friday, November 21

Question 1

The figure below shows a plot of voltage versus time of the signal on the TxD pin of an RS-232 serial interface while one character is transmitted.



Answer the following questions:

(a) Are the voltage levels valid for an RS-232 interface?

(b) What is the (approximate) baud rate?

(c) Assume parity bits are not being used. How many data bits were transmitted?

(d) What character was transmitted?

Question 2

You are trying to connect a computer to a machine tool that uses a 25-pin serial interface. The machine tool does not respond to commands and you suspect there is something wrong with the serial interface. You measure the voltages on various pins of the serial interface on both devices. On the computer you measure 12 volts on the RTS pin. On the machine tool you measure -4 volts on pin 2. What is likely to be the problem? Explain your reasoning. How could you resolve this problem?

Question 3

A computer's parallel printer interface is implemented using a 1-byte output port at address 0x178, a 1-byte status port at address 0x176 and an 1-byte control port at address 0x180. The status of the BUSY signal can be read from the most significant bit of the status port (1=busy, 0=not busy). The other bits of the status port have unknown values. The STROBE signal can be controlled by setting the least-significant bit of the control port (1=high, 0=low). The other bits of the control port have no effect.

Write a C function, `void chprt(char c)` that waits until the printer is not busy, writes `c` to the data port, sets the strobe signal low and then sets it high again. Use the same `speek()` and `spoke()` functions used in the lab.

Question 4

Write a C function declared as `void triangle(int n)` that prints a triangle on the screen. The triangle should be built up from lines of asterisks (`*`). The first line should have one asterisk, the second line two, and so on until a line with `n` asterisks is printed. Then the function should print lines with `n-1`, `n-2`, ... asterisks until printing a line with only one asterisk.

Thus the expression `triangle(4)` would cause the following to be printed:

```
*
**
***
****
***
**
*
```