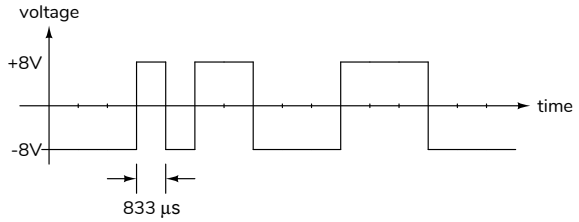
ELEX 3525 : Data Communications
2020 Fall Term

Solutions to Quiz 1

Version 2: Corrected answer to Question 2.1.

Question 1



You view the RS-232 waveform above on a 'scope. Answer the following questions in the space provided below:

1. *What is the bit rate?*

   The bit rate is the inverse of the bit period. The bit period is 833 μs so the bit rate is 1200 bps.

2. *Assuming 8 data bits and one parity bit were transmitted, what byte value was transmitted?*

   The data bits follow the start bit with a 0 encoded as a high voltage and 1 as a low voltage. In time order the 8 bits after the start bit are: 1001 1100. Since the bits are transmitted l.s.b.-first the binary value is 0011 1001, hex 0x39 or decimal 57.

3. *Was even or odd parity used?*

   The parity bit follows the last data bit and is high (0). The total number of '1' bits, including the parity bit is 4, an even number, so even parity was used.

Question 2

Using a DMM on the pins of a serial interface you find that the DSR pin is floating (no voltage present) and the DTR pin is at +9 V. Answer the following questions in the space provided below:

1. Is this interface wired as a DCE or DTE?

   DTR is an output on a DTE and since DTR is high then this interface must be wired as a DTE. DSR is an input on a DTE and so would be expected to be floating.

2. Is DTR asserted (true)?

   Handshaking pins use the opposite convention and a high level is "true", so DSR is true.

Question 3

You measure a noise signal with an oscilloscope. With DC coupling you measure the average voltage as 90 mV. With AC coupling the RMS voltage is measured as 60 mV. What is the probability that the voltage (DC coupled) is negative? In the space below give the answer and show (briefly) how this was computed.

The average voltage is (an approximation of) the mean of the signal. The RMS voltage with AC coupling is the standard deviation. The question asks for the probability that the signal is negative (less than 0). To compute the probability we need to compute the normalised threshold corresponding to 0:

$$t = \frac{v - \mu}{\sigma} = \frac{0 - 0.090}{0.060} = -1.5$$

Using a calculator or the graph we find the probability is 0.0668 or about 7%.