

EE138 Lab 7

UART

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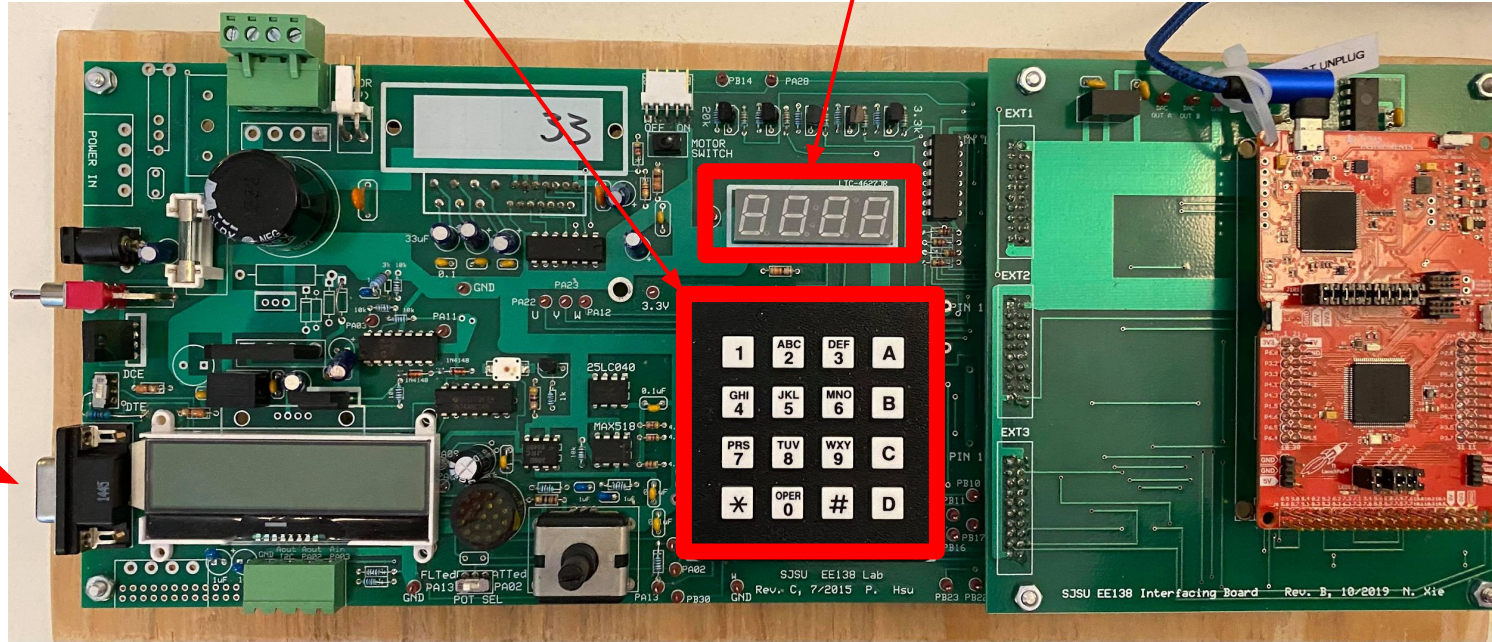
The board

Use to transmit char to Serial Terminal (use button D as enter)

Use to display the received char from Serial Terminal



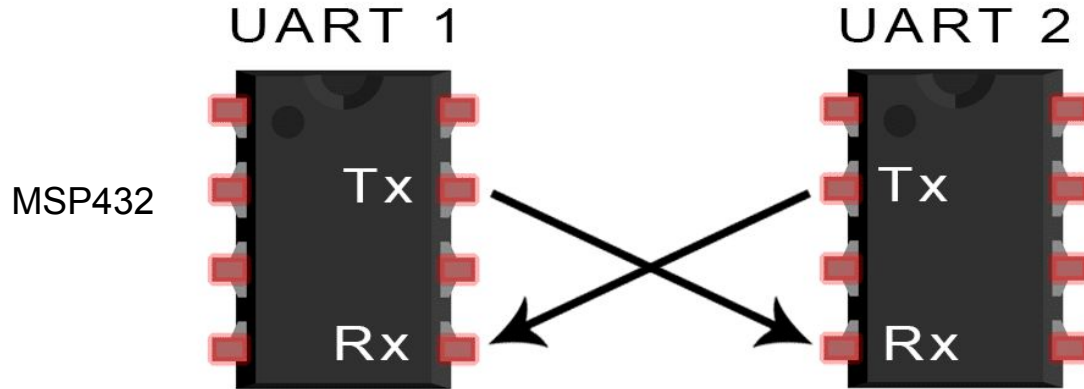
DB9 connector



Lab 7 - Understand the lab

- UART: Transmit characters from the keypad to Termite
- UART: Receive characters on the 7-seg display by typing into Termite terminal
- Use interrupt for UART

Asynchronous Communication



Your laptop
(Termite provides you with the user
interface and baud rate setting)

Install Termite & driver of USB-RS232/LC

Termite:

https://www.compuphase.com/software_termite.htm

driver:

<https://ftdichip.com/drivers/vcp-drivers/>

(see demo)

Termite settings

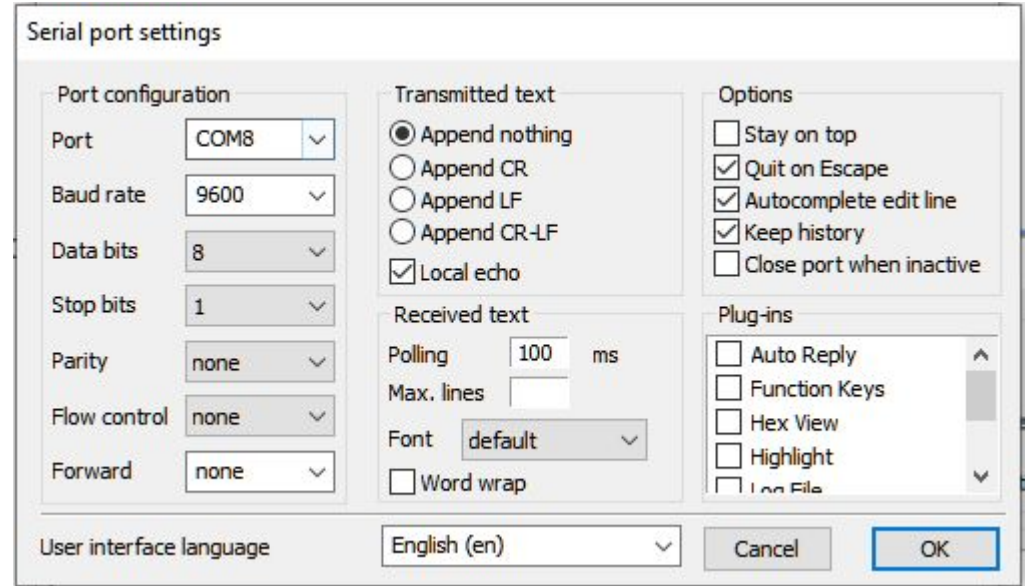
Port: Your MSP432 USB connects to

Baud rate: 9600 or your choice

Data bits: 8 or your choice

Stop bits: 1

Parity: no parity bits



Lab 7 To do

Read the technical reference manual Ch24 Enhanced Universal Serial Communication Interface (eUSCI) – UART Mode

Read the lecture note about the UART and how it works

Watch this video to understand more about UART

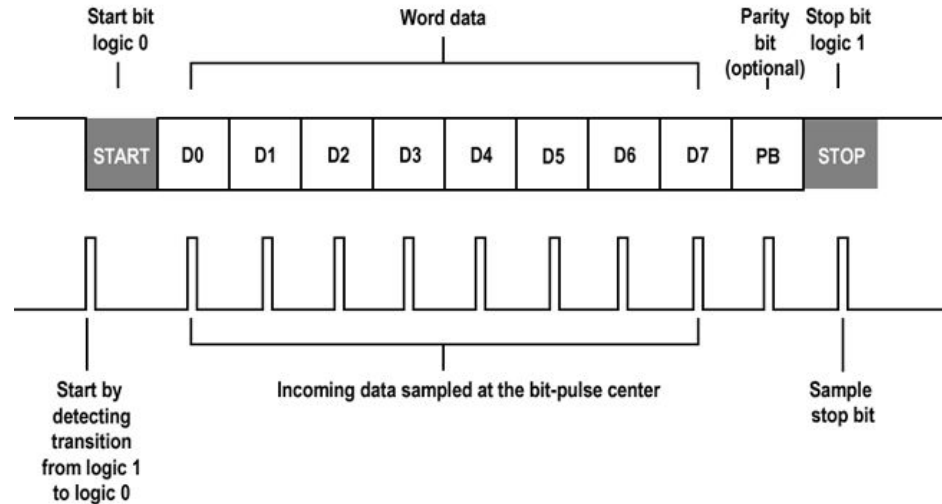
<https://youtu.be/ZzRXKDkMBhA>

UART Recap

Full duplex : can transfer & receive data at the same time

Data is sent in **frames**

If you have to design a protocol that is used to transmit serial data, how would you make sure both communicating devices will receive the correct data?



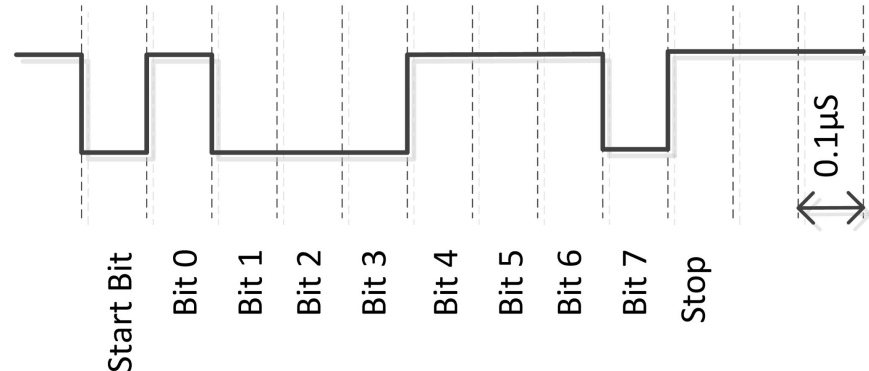
UART: feature

- Unlike parallel communication, in serial communication, data bit is transferred 1 after the other
- Serial communication is mostly used because it only takes 1 line (1 pin from each device) to send and receive data at the same time
- In UART, we spend 2 lines for each device to send & receive data at the same time (full duplex)
- In asynchronous mode, since there is no clock to sync the data transfer, both device has to set to a same baud rate to ensure the data is received properly.

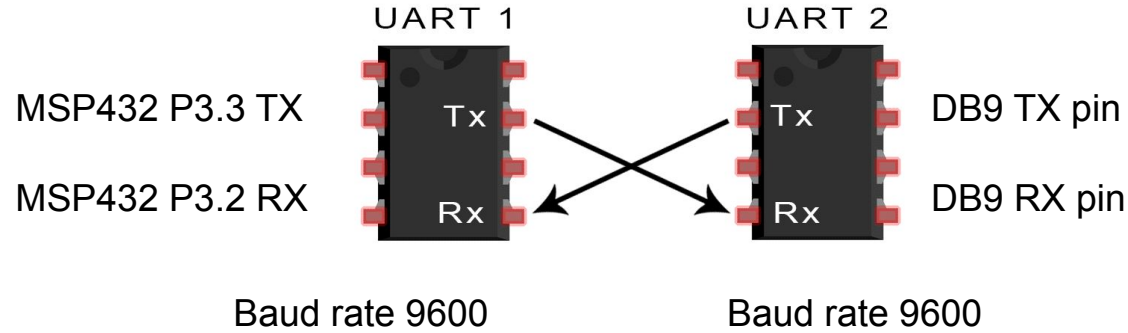
How does the receiving device know how long is “one” cycle to read the data value?

It is important to set the same baud rate for both devices. Otherwise the data transmitted may not match the data received.

0x71, 8N1 (8 Data bits, No Parity, 1 Stop)



UART: under the hood



For UART (asynchronous mode), need same baud rate between 2 devices.

For USART (synchronous mode), there is an extra clock pin connects between 2 devices to sync the data tx/rx

Before you start the lab

Read Chapter 24 UART

Read Chapter 24 UART before you start the lab

Read Chapter 24 UART, it tells you what peripheral clock is available

Read Chapter 24 UART, it tells you how to configure your peripheral

Read Chapter 24 UART, it tells you what registers you need to read from & write to when transmitting & receiving the data frames.

Read the datasheet first

configure P3.2 & P3.3 if you choose to use UCA2STXD and UCA2RXD

use IRQ for UART

void EUSCIAx_IRQHandler(void)

choose your peripheral clock

set/decide your baud rate (check EUSCI_Ax->BRW)

interrupt enable for tx (check EUSCI_Ax->IE)

```
void main(void) {
    simple_clock_init();
    configure_NVIC();
    configure_7segdisplay_keypad();
    debounce_fsm_keyboard();

    configure_uart_pins_setToUARTfunction();
    //parity disabled, lsb first, 8-bit char length, 1 stop bit, asynchronous mode
    configure_UCAx();

    while (1) {
        ; //do nothing
    }
}
```

End of lab 7