USART Module in UART Mode
with the EasyWeb2 Hardware Platform

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Objective: This tutorial discusses the use of MSP430’s USART Device.

Note: Required are all previous tutorials.

1. **Echo a Character**

Let us consider a C application shown in Figure 1. A system with 32KHz crystal on ACLK is connected to a personal computer running HyperTerminal application using a serial RS232 protocol. To realize this communication we use the MSP430’s USART1 device in UART mode.

First, the USART1 is configured in UART mode with the following parameters. The communication speed is 2400 bits/sec (one bit period is 416 us). The USART clock UCLK is connected to ACLK (32 KHz). To achieve the baud rate of the 2400, the internal divider registers are initialized to UBR01=0x0D, and UBR11=0x00. Why? The modulator register UMCTL1=0x6B. See the reference manual for the details how the value in UMCTL1 is determined. You may also use the following utility to determine the values in the USART registers for a given configuration of serial communication (see http://mspgcc.sourceforge.net/baudrate.html). The format of a character is 8-bit ASCII.

The main program is an infinite loop. The MSP430 is in the LPM3 low-power mode. What clock signals are down in this mode? When a new character is received the USART1Rx ISR is executed. In the ISR the MSP430 status register on the stack is modified to enable that the processor is active after executing the ISR. In the main program the received character is sent back to the HyperTerminal (echo), and the processor goes back in the LPM3.
丰满而引人注目的橘色灯笼
在宁静的夜晚
温暖地悬挂着，
点亮了周围的一切。
2. Assignments

Assignment #1: Serial communication (PC to EasyWeb2 and EasyWeb2 to PC)
Write a C application that accepts a character from the HyperTerminal and then echo it twice to the HyperTerminal. The main program is an infinite loop waiting for a new character (received through an interrupt service routine); after a character is received it sends its value back to the HyperTerminal twice, followed by a *new line* and a *carriage return* characters.

Note UART mode: Baud rate is 38400 bps, 8-bit characters

To set up the HyperTerminal do the following:
- Connecting using: COM1
- Bit per second: 38400
- Data bits: 8
- Parity: none
- Stop bits: 1
- Flow control: use Xon/Xoff

Assignment #2: Serial communication (EasyWeb2 to PC)
Write a C application that will maintain a real-time clock in the following format: <<hh:mm:ss>>. The current value of the time is sent serially to the PC via asynchronous serial link. Utilize low-power modes of the MSP430 to conserve energy.