Prelab for Lab #7: System Timer and Interrupts
Week of 21 March 2022

Part A – Textbook Readings / Videos

1. Read Textbook `Chapter 11.1 - 11.7` to review interrupts and the system timer.

2. For background on how the timer works, the textbook recommends the following videos (note, I haven't extensively reviewed these).

   (a) Interrupts: `http://www.youtube.com/watch?v=uFBNf7F3l60`

   (b) SysTick: `http://www.youtube.com/watch?v=aLCUDv_fgoU`

   (c) External Interrupt: `http://www.youtube.com/watch?v=uKwD3JuRWeA`

Part B – Prelab assignment

In this lab you will set the system timer (SysTick) to generate interrupts with a period of 1ms. In the lab we will use this interrupt to create a `delay()` function that will count down, once per interrupt, so that we can do things like call `delay(1000)` to delay for a second.

1. Setting the board to run at 8MHz

As can be seen in Figure 1 the clock configuration is complex on our board.

For this lab we will set the board to use an 8MHz "MSI" clock. (By default the board usually runs a 4MHz MSI clock, but can run from 100kHz up to 80MHz depending on how you have it configured).

To enable the 8MHz MSI clock you will set the MSIRANGE bits of the `RCC_CR` (Reset+Clock Control - Control Register) to pick 8MHz. See the **"STM32L4x5 and STM32L4x6 advanced Arm-based 32-bit MCUs"** manual for how to do this, it's in Chapter 6 "Reset and Clock Control", with the RCC bits in section 6.4.1.

What value do we want to set the MSIRANGE bits to be to enable an 8MHz clock?

MSIRANGE = _____

2. Picking the SysTick Reload Value

In this lab you will set up the system timer (SysTick) to generate interrupts with a period of 1ms (1000Hz).

The SysTick hardware will decrement once per clock cycle (so 8MHz when using the MSI clock we configured earlier). When it hits zero, it will generate an interrupt.
Thus the formula calculating the value to load looks like this:

$$InterruptPeriod = (1 + VALUE) \times \frac{1}{TimerFrequency}$$

If we want an interrupt period of 1ms and we have a frequency of 8MHz, what VALUE do we want?
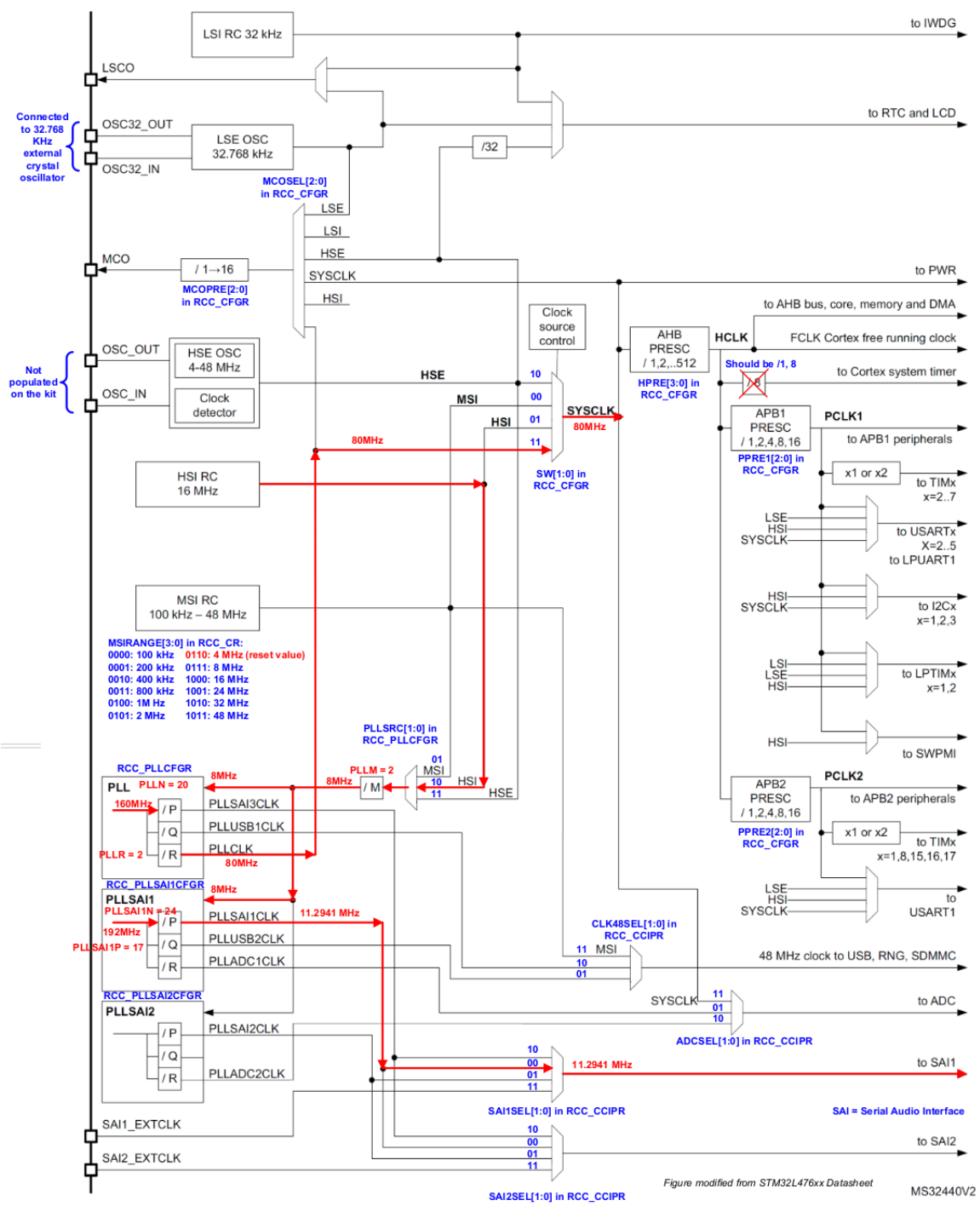
VALUE = _____

Figure 1: Timers on the Discovery board are complex, as seen in this diagram from the manual.