

Prelab for Lab #9: Input Capture and Distance Sensor

Week of 8 April 2019

Part A – Textbook Readings / Videos

1. Read Textbook Chapter 15.4 to review input capture.

Part B – Prelab assignment

In this lab we will set up the TIM4 timer for input capture on pin PB6 and the TIM1 timer to generate a trigger pulse on pin PE11.

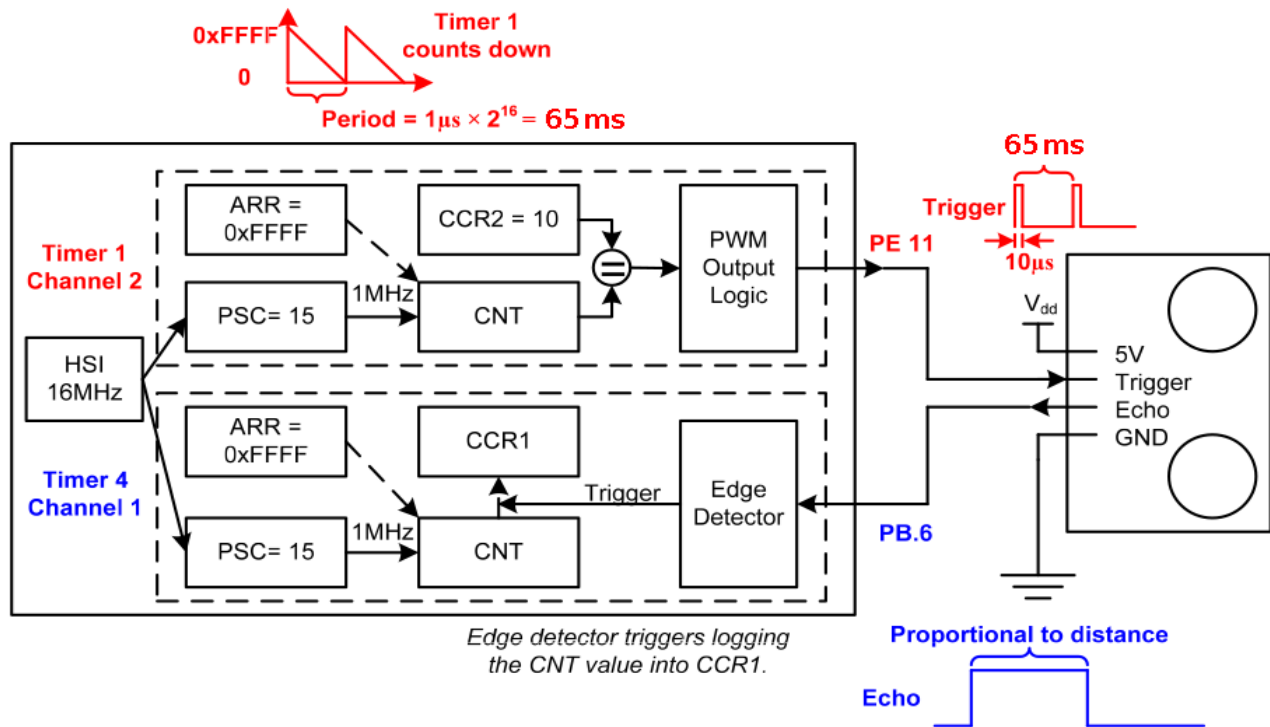


Figure 1: Timer setup for lab.

1. Doing input capture with timer TIM4

For this lab we will be using the 16MHz HSI timer.

The formula is $f_{timer_clock} = \frac{f_{HSI}}{1+PSC}$

1. What value should you use for the PSC to get a counting increment of $1\mu s$?
2. For the prescaler value in PSC, with the 16-bit TIM4 timer, how long (in terms of seconds) does it take for a counter overflow or underflow event to occur?

2. Settings needed to have pin PE11 connected to timer TIM1 Channel 2

You will need to set the following fields. Write the values to mask/set. If no mask is needed you can let that blank. You can use pre-defined names for the bits rather than raw hex values.

- Set `GPIOE->MODER` for pin 11 to be “alternate” mode.
MASK MODER=_____
VALUE MODER=_____
- Set `GPIOE->AFR[0]` and `GPIOE->AFR[1]` for alternate function of Pin 11 to be `TIM1_CH2`. You can look in Appendix I of the book to see which one this is. This should be in one of the document pdfs too but I wasn't able to find which one.
MASK AFR[0]=_____
VALUE AFR[0]=_____
MASK AFR[1]=_____
VALUE AFR[1]=_____
- Set `GPIOE->OTYPER` for Pin 11 to be push-pull
MASK OTYPER=_____
VALUE OTYPER=_____
- Set `GPIOE->PUPDR` for Pin 11 for no pull-up/pull-down
MASK PUPDR=_____
VALUE PUPDR=_____

3. Settings needed to generate a 10 μ s pulse on PE11

You will need to set the following fields. Write the values to mask/set. If no mask is needed you can let that blank. You can use pre-defined names for the bits rather than raw hex values.

- Set `TIM1->CR1` for the counting direction to be up.
MASK CR1=_____
VALUE CR1=_____
- We will use a 16MHz HSI clock for this lab. Set the prescaler `TIM1->PSC` to count at 1MHz.
MASK PSC=_____
VALUE PSC=_____
- Set the `TIM1->ARR` register to give the maximum possible period
MASK ARR=_____
VALUE ARR=_____

- Clear the OC2M field in the TIM1->CCMR1 register and select PWM Mode 1 (OC2M = 110):
 MASK CCMR1= _____
 VALUE CCMR1= _____
- Enable the Output 2 preload enable in TIM1->CCMR1 (OC2PE): MASK CCMR1= _____
 VALUE CCMR1= _____
- Select the output polarity by clearing the CC2P field in the TIM1->CCER register:
 MASK CCER= _____
 VALUE CCER= _____
- Enable output of Channel 2 (CH2) by setting the CC2E bit in TIM1->CCER:
 MASK CCER= _____
 VALUE CCER= _____
- Set the main output enable (MOE) in TIM1->BDTR :
 MASK BDTR= _____
 VALUE BDTR= _____
- Set the output compare register for channel 2 TIM1->CCR2 to be on for 10 μ s each period: MASK
 CCR2= _____
 VALUE CCR2= _____