Timer Setup for Capture

STM32L476VG Discovery board

Overview:

The Discovery board has a variety of timers ranging from very substantial supporting functions through very basic timers. This document discusses setting up a basic event capture from a GPIO input. This should apply to all timers.

Documents:

You need to have the Reference Manual (RM) RM0351 STM32L4x6 advanced ARM-based 32-bit MCUs manual: http://www.se.rit.edu/~swen-563/resources/STM32L476/STM32L476VGT6%20Reference%20manual.pdf.

You also need to have the STM32L476xx datasheet (DS) http://www.se.rit.edu/~swen-563/resources/STM32L476/STM32L476VGT6%20Datasheets.pdf

The following sections will reference these documents as RM and DS respectively.

Timer Selection:

First determine what features are needed. This board has two advanced timers (TIM1/TIM8), four general purpose timers (TIM2 through TIM5) and three additional reduced feature set general purpose timers (TIM15 through 17). Timers TIM2 and TIM5 are 32 bit timers which provide the obvious range advantage over the 16 bit timers.

Refer to the “main features” overviews in the RM Chapter 26 (page 745), Chapter 27 (page 850), and Chapter 28 (page 923) to select an appropriate timer.

Timer Configuration:

First be sure to enable the clock for the selected timer in the RCC->APB1ENR1 register. Then load your prescaler value into the TIMx->PSC register. Be sure to force the load of the new prescaler value by creating an update event using the TIMx->EGR register.

Timer Capture Configuration:

For your selected timer confirm that one of its capture inputs is supported as an alternate function on an acceptable input pin on P1 or P2. Refer to the Alternate Functions section of the “GPIO and Alternate Function Setup” guide for how to make this determination.

Refer to the selected timer’s “Input capture mode” in the RM. For timers TIM2 through TIM5 go to page 870.

First turn off the input capture by turning off the output enable for that capture input in the TIMx->CCER register. This ensures that your changes will take effect when you re-enable that capture input. Note that this enable bit works for both input and output configurations.

Then, set up the CCMRx register for the desired capture channel and also make sure that the input event filter is cleared. The input event filter is a mechanism for filtering noisy input data from a poor communication channel or from contact bounces on a mechanical push button switch.

To complete the configuration set the enable bit for the input channel.

Timer Operation:

To actually start doing an input capture set the TIM_CRx_CEN bit in the TIMx->CRx register. Clear this bit to stop input capture.

The current timer count will be automatically be loaded into the TIMx->CCRx register when a capture event occurs. At the same time the TIM_SR_CCxIF bit will be set in the TIMx->SR register indicating that an input capture has occurred. Reading the captured counter value from the TIMx->CCRx register will automatically clear the IF bit in the SR register. This is a typical convenience feature since the hardware knows that you have read the captured value.