TPM0 Setup for Ultrasound Distance Measurement rev2

Set up TPM0 to measure distance by measuring the length of a pulse created by an US100 ultrasound sensor. The pulse will be input on PortD pin 0. A measurement is initiated with a 10us pulse of PortD pin 7. Pulse length will be measured in units of 0.33us using TPM0 channels 0 and 1.

Procedure to initialize TPM0 for pulse measurement — page number in reference [2] unless noted as ref [1]

1) Turn on bus clocks
   Registers: set bits in SIM->SCGC5 and SIM->SCGC6
   SIM_SCGC5_PORTD_MASK 206
   SIM_SCGC6_TPM0_MASK 208

2) Configure pin PTD0 for connection to TPM0_ch0 by changing port mux field 184
   Register: PORTD->PCR[0] which is the PCR register for bit 0
   clear current mux setting by ANDing ~PORT_PCR_MUX_MASK 47[1]
   insert desired function using PORT_PCR_MUX(x) where x is desired function

3) Set clock source for TPM:. TPMSRC and choose PLL (48Mhz clock)
   Register: SIM->SOPT2
   set 2 bits using SIM_SOPT2_TPMSRC(x) where x needs to be 0, 1, or 2 196
   set 1 bit using SIM_SOPT2_PLLFLLSEL_MASK

4) Make sure timer is turned off (meaning the clock that runs the counter is off)
   Register: TPM0->SC 552
   set all bits to zero by writing a zero to this register which turns off the counter and resets falgs

5) Set TPM0 channel 0 for input capture on falling edge .
   Register: TPM0->CONTROLS[0].CnSC where 0 selects TPM0 channel 0
   set bit ELSnB using TPM_CnSC_ELSB_MASK 555
   (Note that 1 bit out of 4 is non-zero: ELSnB.)

6) Recommendation: Allow the clock to run in debug mode
   Register: TPM0->CONF
   set 2 bits using TPM_CONF_DBGMODE(3) 561

7) Set the prescaler value (select prescale value to obtain a 13 Mhz clock rate)
   Register: TPM0->SC
   set 3 bits using TPM_SC_PS(value) 553

8) Clear count register
   TPM0->CNT = 0x0000

9) Load MOD register with maximum count
   TPM0->MOD = 0xffff 554