Pulse Width Modulation Setup

Create a PWM output on PTD5 using TPM0 channel 5. PWM period is to be 20 milliseconds (50 Hz) with pulse length of 1.5 milliseconds.

Procedure to configure TPM0 for PWM — 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 PTD5 for connection to TPM0_ch5 by changing port mux field — 184
   Register: PORTD->PCR[5] which is PCR register bit 5
   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

5) Set TPM0 channel 5 for edge aligned, high-true pulse, PWM .
   Note that 4 bits are involved: MSnB, MSnA, ELSnB, and ELSnA. When 2 or more of these bits need to be set they must be set simultaneously. Setting one and then setting another doesn't work.
   Register: TPM0->CONTROLS[5].CnSC where 5 selects TPM0 channel 5
   set bit MSnB using TPM_CnSC_MSB_MASK — 555
   set bit ELSnB using TPM_CnSC_ELSB_MASK

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 3Mhz clock rate)
   Register: TPM0->SC
   set 3 bits using TPM_SC_PS(value) — 553

8) Load MOD register with maximum count to achieve 20msec period
   TPM0->MOD = _ _ _ _ _ — 554

9) Load CnV register to establish pulse length of 1.5msec
   TPM0->CONTROLS[5].CnV = _ _ _ _ — 557

10) Turn on TPM0 (Enable clock)
    Register: TPM0->SC and the CMOD field
    set 2 bits using TPM_SC_CMOD(x) where x can be 0, 1, or 2 — 553