**ADLINK Technical Document**

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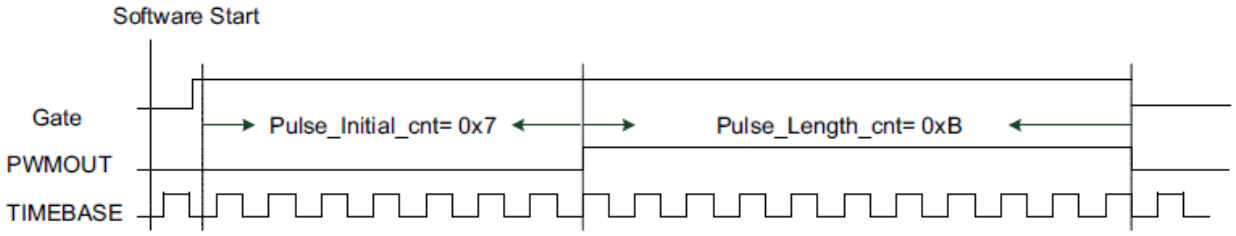
|---|---|---|---|
| **Abstract** | How to Generate a PWM Signal Out | | |
| **OS** | Windows | | |
| **Keyword** | GPTC | | |
| **Related Products** | USB-1210, USB-2401, USB-1901, USB-1902, USB-1903 | | |
| **Date** | 2021-12-23 | No. | |

- Issue Details:

This document outlines how to generate a PWM signal out, one of the several GPTC functions available to users.

- More information:

The USB-DAQ timer/counter can simulate a Pulse Width Modulation (PWM) output. The PWM generates output following a GPTC_GATE edge trigger or being activated/deactivated by the GPTC_GATE high/low logic control. Adjusting the values of Pulse_initial_cnt and Pulse_length_cnt produces different pulse frequencies (Fpwm) and duty cycles (Dutypwm). PWM output is shown below.



- Solution:

**Step 1: Identify Pins**

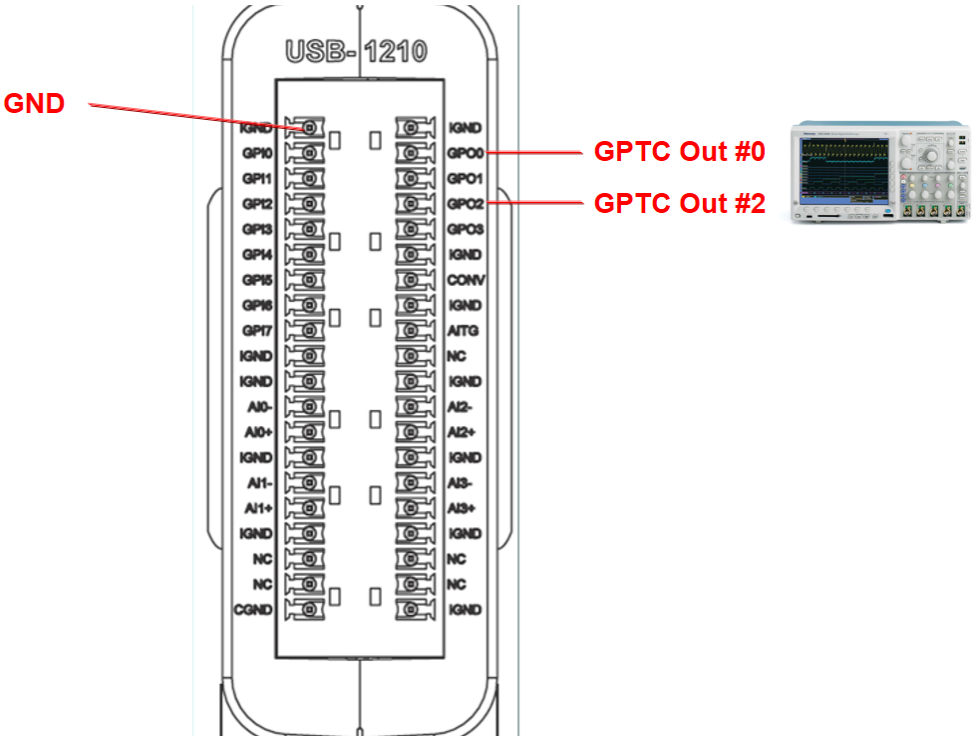
Refer to the user manual and check the pin definitions to find the GPTC_OUT0 and GPTC_OUT2 pin numbers. For the USB-1210, the GPTC_OUT#0 is pin 39 and the GPTC_OUT#2 is pin 37.

| | Pin | Pin | |
|---|---|---|---|
| IGND | 20 | 40 | IGND |
| GPTC_CLK | 19 | 39 | GPTC_OUT0 |
| GPTC_UD0 | 18 | 38 | GPTC_OUT1 |
| GPTC_GATE0 | 17 | 37 | GPTC_OUT2 |
| GPTC_AUX0 | 16 | 36 | GPTC_OUT3 |
| GPTC_CLK2 | 15 | 35 | IGND |
| GPTC_UD2 | 14 | 34 | N/C* |
| GPTC_GATE2 | 13 | 33 | N/C* |
| GPTC_AUX2 | 12 | 32 | N/C* |
| IGND | 11 | 31 | N/C* |

| | Pin# | Pin# | |
|---|---|---|---|
| IGND | 20 | 40 | IGND |
| GPI0 | 19 | 39 | GPO0 |
| GPI1 | 18 | 38 | GPO1 |
| GPI2 | 17 | 37 | GPO2 |
| GPI3 | 16 | 36 | GPO3 |
| GPI4 | 15 | 35 | IGND |
| GPI5 | 14 | 34 | N/C* |
| GPI6 | 13 | 33 | N/C* |
| GPI7 | 12 | 32 | N/C* |
| IGND | 11 | 31 | N/C* |

**Step 2: Connect Pins**

Connect the wiring as shown.

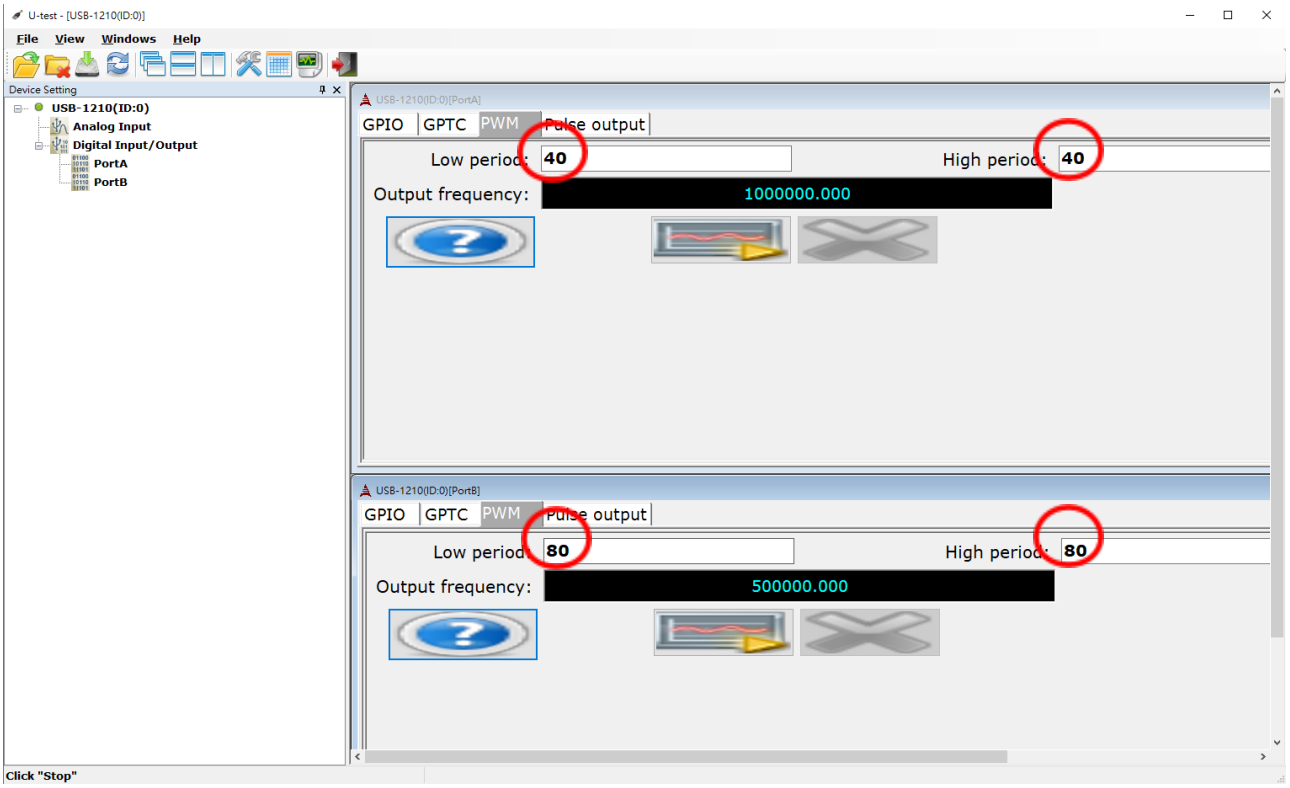



**Step 3: Install U-Test**

Download and install the U-Test utility from the ADLINK website.

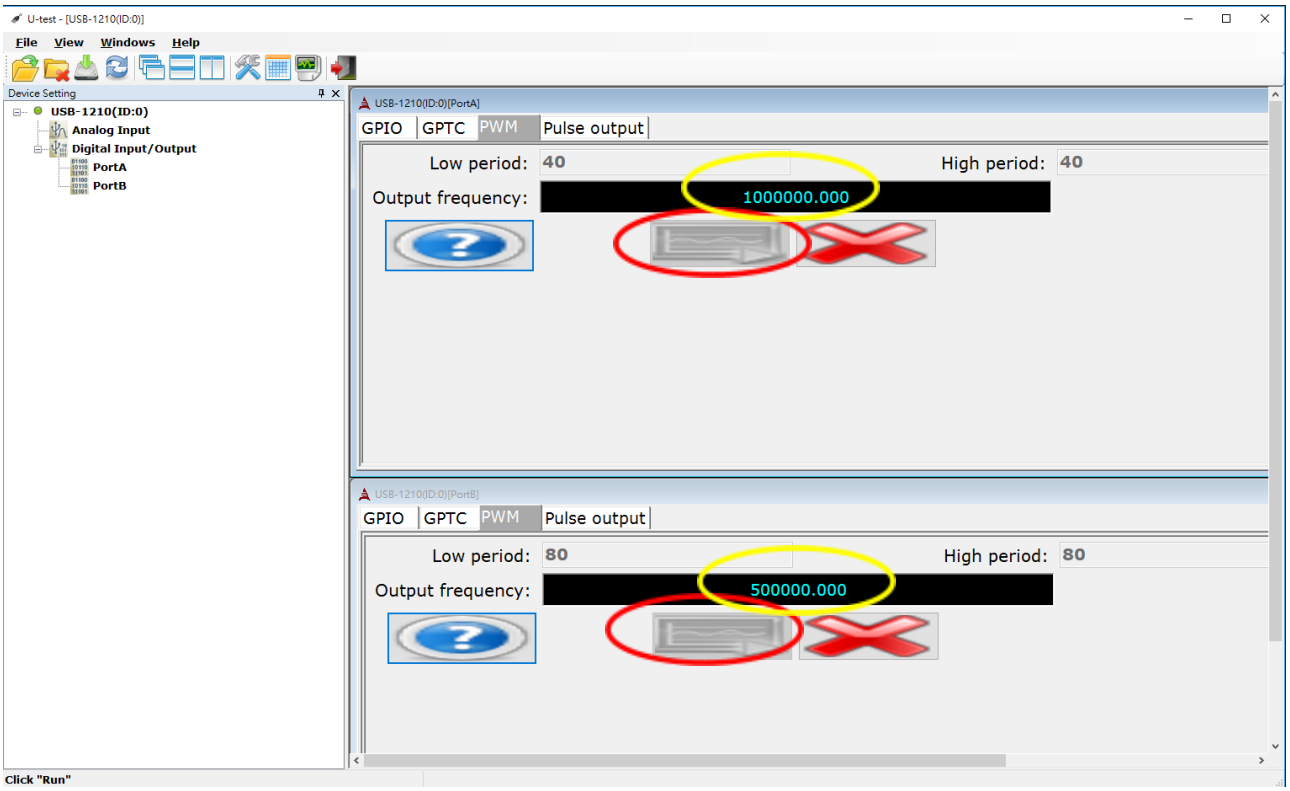
**Step 4: Settings**

1. Launch U-Test
2. Click Digital Input/Output
3. Select the PWM tab
4. Enter low and high period values as follows:
    a. part#A(#0): low period = 40, high period = 40
    b. part#A(#1): low period = 80, high period = 80



### Step 5: Initiate PWM Signal

Click Run to begin DAQ card PWM signal output on GPTC_OUT0(/portA) and GPTC_OUT1(/portB). U-Test also calculates the theoretical output frequency and displays it on the screen.




$$F_{PWM} = \frac{F_{Timebase}}{Pulse\_initial\_cnt + Pulse\_length\_cnt}$$

$$Duty_{PWM} = \frac{Pulse\_length\_cnt}{Pulse\_initial\_cnt + Pulse\_length\_cnt}$$

**Step 6: Check Scope**

A 1MHz and 500KHz square wave display on the scope because the base-clock frequency of the USB-1210 is 80MHz. The sum of the high and low period is identical to the waveform period. The equipollent frequencies are as follows:

a. GPTC_OUT0: 80MHz/(40+40) = 1 MHz
b. GPTC_OUT1: 80MHz/(80+80) = 500 KHz.