

Generating Repetitive Pulses with Timer1 on the Flashlite186 Board

Timer1 can be used to generate square waves and repetitive pulses with a frequency range of 9.09 Hz to 4.167 Mhz. This note will explain how to configure the timer to produce these signals.

Initial configuration

First of all, pin 73 of the CPU must be configured as Timer1 output rather than as programmed I/O. To do this, bit 1 of both the PIO Mode 0 register and the PIO Direction 0 register must be cleared. Perform the following in the language of your choice:

```
Do a 16-bit input from port 0xFF70          /* get PIO Mode 0
Do a bitwise AND of the value returned and 0xFFFFD /* clear bit 1
Do a 16-bit output of the value to port 0xFF70    /* set PIO Mode 0

Do a 16-bit input from port 0xFF72          /* get PIO Direction 0
Do a bitwise AND of the value returned and 0xFFFFD /* clear bit 1
Do a 16-bit output of the value to port 0xFF72    /* set PIO Direction 0
```

Next, we will determine the count values to set in the Maxcount registers. A combination of the count values and the clock source will determine the frequency and duty cycle available from the timer. The output waveform is generated as follows: with a starting high Timer1 output, the Timer1 count register is incremented with each cycle of the clock until the count register is equal to MaxcountA. At that time, the count register is cleared and the output is made low. Next, the count register is incremented until it is equal to MaxcountB. At that time, the count register is cleared, the output is made high, and the sequence repeats.

It should be evident that if both Maxcount registers are set to the same value, the output will be a square wave. Conversely, by programming the on-time in MaxcountA and the off-time in MaxcountB, a pulse of arbitrary frequency and duty cycle may be produced.

The clock source for Timer1 can originate from either the crystal oscillator divided by 4 (8.333 Mhz) or the output of Timer2 (1.190 Mhz). With the 8.333 Mhz clock, the highest frequency available is 4.167 Mhz (Maxcount registers set to 1), and the lowest frequency available is 63.58 Hz (Maxcount registers set to 0xFFFF).

With the 1.190 Mhz clock, the highest frequency available is 595 KHz (Maxcount registers set to 1) and the lowest frequency is 9.08 Hz (Maxcount registers set to 0xFFFF).

Example Values

2 KHz square wave – 8.333 Mhz clock, MaxcountA and B set to 2083 (0x823).

10 KHz repetitive pulse, 20% on, 80% off – 8.333 Mhz clock, MaxcountA set to 167 (0xA7) and MaxcountB set to 666 (0x29A)

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10 Hz square wave – 1.190 Mhz clock, MaxcountA and B set to 59500 (0xE86C).

20 Hz pulse train, 60% on, 40% off – 1.190 Mhz clock, MaxcountA set to 35700 (0x8B74) and MaxcountB set to 23800 (0x5CF8).

Loading, Starting and Stopping the Timer

To move the calculated data for your application into the Maxcount registers, write the following code in the language of your choice:

```
Do a 16-bit output of the MaxcountA value to port 0xFF5A  
Do a 16-bit output of the MaxcountB value to port 0xFF5C
```

To start the timer and begin outputting pulses with a 1.190 Mhz clock, write the following code:

```
Do a 16-bit output of 0xC00B to port 0xFF5E (Timer1 control)
```

To start the timer and begin outputting pulses with an 8.333 Mhz clock, write the following code:

```
Do a 16-bit output of 0xC003 to port 0xFF5E (Timer1 control)
```

To stop the timer and output pulses, write the following code:

```
Do a 16-bit output of 0x4000 to port 0xFF5E (Timer1 control)
```

Once started and stopped, the timer can be restarted by reloading the Timer1 control register. None of the other registers need to be restored.

The Timer1 output signal appears on J9, pin 10 of the Flashlite186 board.