Exam 1 in 2 weeks 2/25, 10 AM - 11:50 AM Room TBA

Closed-Book, Closed Notes.

1 Crib sheet (front & Back) PROVIDED - Also on webex

Bring Calculators!

Last semester Exam (to be) posted on Webex.

for code:

Can shorthand code such that we still understand function/variable... intended for use.

Pseudocode is not accepted unless explicitly asked for.

Content:

Everything up to and including timers & interrupts.

Ex. 1

Assume Up-Mode

$f_{TIMCLK} = 12\ MHz$

$N_{DIV} = 4$

$f_{TIMCLK} = 12MHz/4 = 3\ MHz$

$T_{TIMCLK} = 1/f_{TIMCLK} = 333\ ns$

$N_{period} = \frac{T_{period}}{T_{TIMCLK}} = 300$ counts (100 ms) → $N_{max} = N_{period} - 1 = 299$

→ .period = 299

---

interrupt:

→ Enable ZERO or LOAD event

→ Enable TIMG# interrupt

→ write function for it:

```
void TIMG#_IRQHandler(void){
    → Clear the event/interrupt flag.
    resets++;
}
```

A) $\frac{500\ ms}{100\ ms} = 5000$ resets per 500 ms

```
resets = 0;
while(resets < 5000);
```

Ex. 1

A.i

$f_{TIMclk} = 12MHz/64 = 187.5\,kHz$

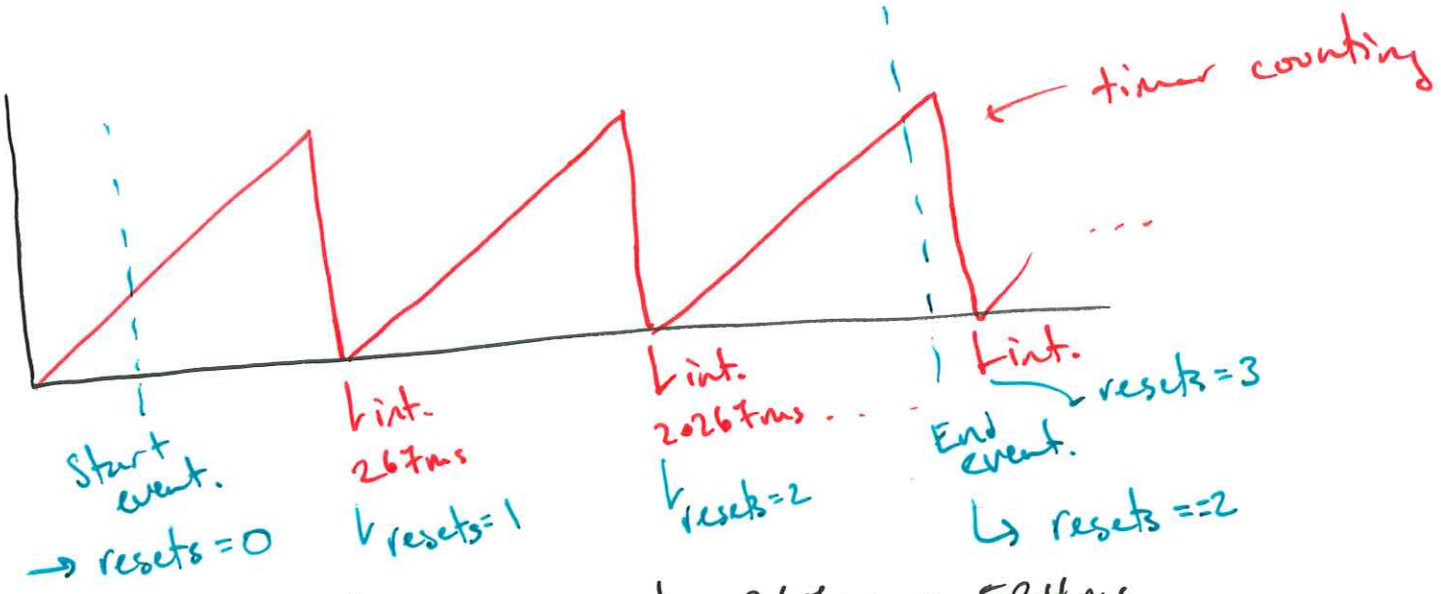
.period = 50000 → Nperiod = 50001

$T_{period} = N_{period}/f_{TIMclk} = 2.67\,s$ ← way to large for 500ms delay.

.period = 5000

→ Tperiod = 267 ms ← can get rough 500 ms program delay.

B.i

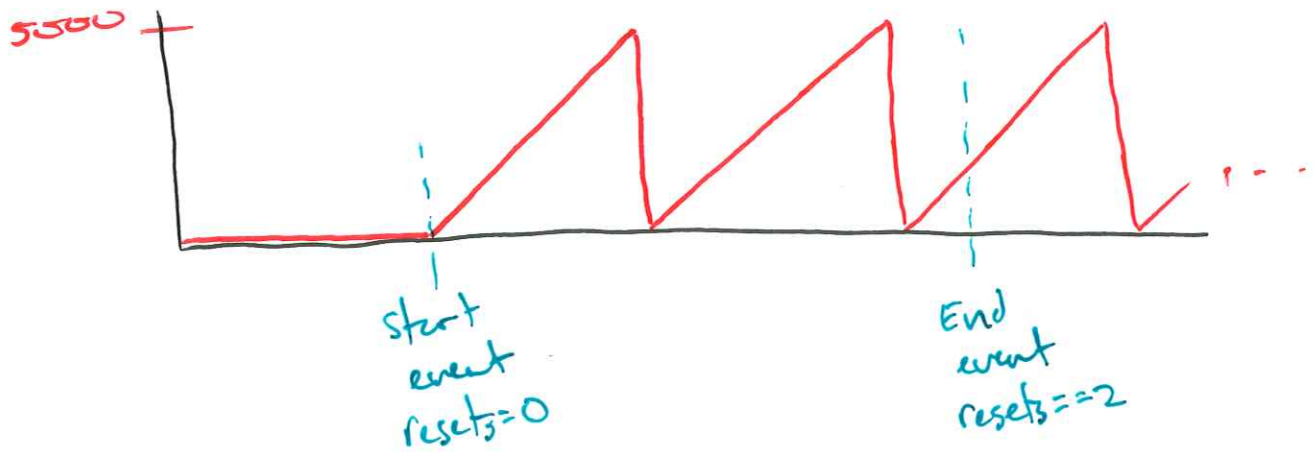


Total time = resets • 267ms = 534ms

By diagram: Large error! error ±267ms.

Improve on Error a little bit:

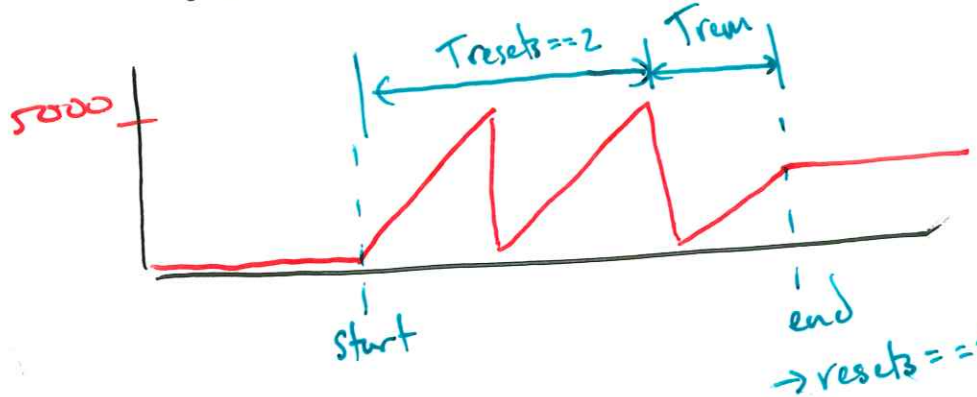
Start timer at start event:



Reduced error to ~~error~~ $0 \leq \text{error} \leq 26.7\text{ms}$

B ii | Improve on error a lot.

End timer at end event:



known easily as resets · 26.7ms.

$T_{event} = T_{resets==2} + T_{rem}$

T_{rem}: from value of timer counter.

----> timer count reg.

$T_{rem} = \text{Timer count reg} \cdot T_{TIMxCLK}$

Ex 2| Smallest divider for $T_{period} = 10ms$

$f_{INCLK} = 32MHz$

Assume TIM4 in up-mode

↳ 16-bit timer. → max $N_{period} = 65536$ $(=2^{16})$

with max possible counts, what is required N_{div}?

$T_{period} = 10ms = N_{period} \cdot T_{TIMCLK}$ → $T_{TIMCLK} = 152.6ns$

→ $f_{TIMCLK} = 6.55MHz$

$f_{TIMCLK} = f_{INCLK}/N_{div}$ → $N_{div} = 4.883$

N_{div} must be an integer! Must Round UP

$N_{div} = 5$

→ $f_{TIMCLK} = 6.4\,MHz$ → $T_{TIMCLK} = 156.3ns$

$T_{period} = 10ms = N_{period} \cdot 156.3ns$

→ $N_{period} = 64000$ → period = 63999

Resolution = $T_{TIMCLK} = 156.3ns$.