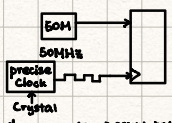
Measuring time in hardware:



- down counter → count 50M → 1sec
- Use a down counter to convert a precise clock (oscillator not RC but crystal)
- ARM processor - "A9 Timer" which works like above but accessed through memory-mapped registers.
- Connect to a counter, clocked with precise 200 MHz

4 registers

Address		Reg. name
0xFFFE C600	31 … 0	Load - put the value to count down from
604	31 … 0	Counter - value of current count
608	2 1 0 (I A E; Enable, Auto, Int)	Control
60C	0 (F; Finish)	Interrupt State Reg.

- Software-controlled hardware timer works as follow: reset F bit before the next count down
  1. Put the value you want to count down from into the LOAD register.
     e.g: (200M)10 for 1 second of time
  2. Turn on the E bit in the control register
     → causes the Load register to be copied into the counter and to start counting down to 0
  3. When counter reaches to zero → F bit of Interrupt States Reg to 1
  4. To reset the F bit to zero → write a 1 into it (like edge-capture reg.)
  5. To have counter reload & do it again → set A bit in Control reg.
- Program to turn an LED on/off every second exactly. using timer & polling

```
_start:  LDR   R0,=0xFF20 0000     // LED base addess
         MOV   R2,#1               // Wait goes into LED
         LDR   R8,=0xFFFE C600     // Base address of A9 private timer
         LDR   R3,=200 000 000     // value of Load Reg = 200 M → 1 sec counter
         STR   R3,[R8]             // puts into Load Reg
         MOV   R3,#0b011           // Turn on A & E bit in control reg.
         STR   R3,[R8,#8]
Display: STR   R2,[R0]             // Turn R2 on/off depends on R2
         EOR   R2,#1               // Toggle LED bit
// Poll the timer to wait for 1 second count down
Wait:    LDR   R3,[R8,#0xC]        // Read interrupt status register
polling  ANDS  R3,#1               // isolate bit 0
loop     BEQ   Wait                // timer hits 0
         STR   R8,[R8,#0xC]        // Reset F bit to 0
         B     Display
```

To synchronize with interrupts & not polling