Chapter 6

PROGRAMMING THE TIMERS

Lesson 3

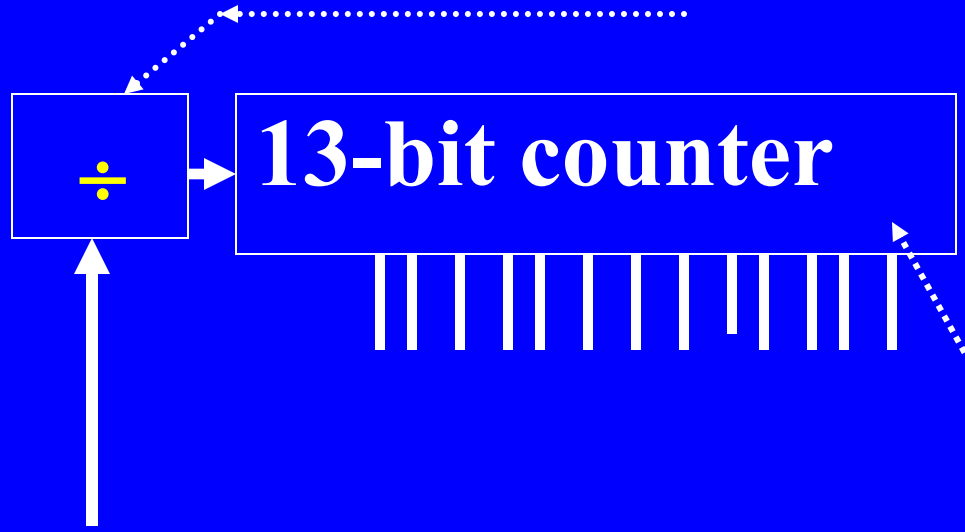
Real Time Clocked Interrupts and Software Timers

Real Time Clock Interrupt

Real Time interrupts Prescaling

- Pre-scaling by RT1-RT0 bits for 4 or 8 or 16 $\times 2^{13} \times 0.5\ \mu s$ = 1, 2, 4, or 8 × 4.096 ms rate interrupts
- Counts 2^{13} clock inputs, each of period 0.5μs for 8MHz XTAL

68HC11 Real Time Interrupts programmability



Internal clock input rate 1 or 4 or 8 or 16 factor programmable by RT1-RT0 bits

Count Inputs from internal clock E Clock

Interrupt service on 13-bits count overflow programmable by mask bit

Feature of Real Time interrupts

- 68HC11 Real Time Overflow interrupts programmable for r × 4.096 ms rate only within 64 clock cycles of start up of 68HC11 MCU [r= 1 or 2 or 4 or 8]
- Interrupts are programmable at 4 or 8 or 16 or 32.768 ms rates for 8MHz XTAL at any instance of the program

Feature of Real Time interrupts

- RT Interrupt flag bit distinct from that for TCNT OV
- RT Interrupt enabling/disabling bit distinct from that for TCNT OV
- RT Interrupt ISR_Vect_Addr is distinct from that for TCNT overflow interrupt

Applications

- Performing periodic tasks at 1, 2, 4, or 8 × 4.096 ms intervals
- Multi-tasking with tasks scheduled to switch context from one to another at periodic intervals
- Programming switching periodically to supervisory mode at periodic intervals

Software Timer

SWT (software timer) value is programmed with bits,which are compared with counts *x* of a running timer (free running or programmable)

When *x* reaches the programmed bits, an interrupt called software timer activates.

8096 Software Timers

- The ISR corresponding to SWT activates executes in case previously enabled
- Four SWTs, SWT0, SWT1,SWT2,SWT3: a common ISR_Vect_Addr addresses but distinct interrupt pending flags in 80x96

Feature of 8096 SWT interrupts

- 68HC11 Overflow interrupts are programmable for r ×4.096 ms rate only within 64 clock cycles of start up of 68HC11 MCU
- Each 80x96 SWT Interrupt programmable at any time for a given 16-bit timer instance

SWT Interrupts-80x96

- Select an SWTn; n = 0, 1, 3 or 4
- No Pre-scaling
- Select either Free running counter T1 or programmable timer T2 for SWT Clock inputs
- Compare SWTn bits with selected T1 or T2 timer counts = x

SWT Interrupts-80x96

- Common SWTs Interrupt Vector
- 4 SWTn Interrupt Enable bits
- 4 SWTn Interrupt Pending flags
- 4 SWT Interrupt ISRs called as per SWTn from instruction at the common vector address

Applications

- Performing tasks at specified instances
- Multi-tasking with tasks scheduled to switch context from one to another at the prefixed instances
- No output pin like out compare, only SWT ISR executes on comparison successful for equality.

Summary

We learnt

Real Time interrupts -

- Programmable at any instance unlike TCNT overflow
- Programmable to 4,8,16 and 32 ms for 8Mz clock by rate-bits RT1-RT0
- A flag on real time interrupts
- A service routine executes
- Maskable Interrupt

We learnt

Software Times devices -

- Programmable bits at any instance like OC register bits
- Maskable
- Interrupt occurrence instance programmable with respect to to free running counter-timer T1 or programmable counter-timer T2
- Sets an interrupt pending flag