MICROCONTROLLER

UNIT-III

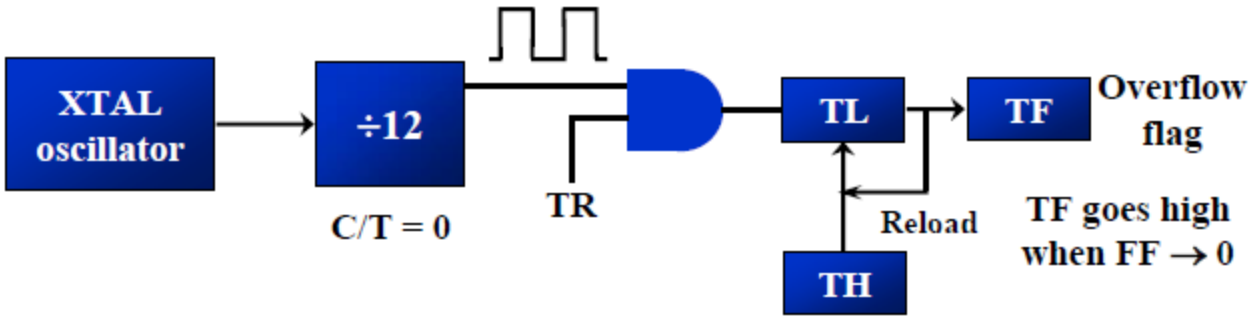
Lecture-3

Mode 2 Programming

- The following are the characteristics and operations of mode 2:

(1.) It is an 8-bit timer; therefore, it allows only values of 00 to FFH to be loaded into the timer's register TH

(2.) After TH is loaded with the 8-bit value, the 8051 gives a copy of it to TL



Contd.

- Then the timer must be started
- This is done by the instruction SETB TR0 for timer 0 and SETB TR1 for timer 1

(3.) After the timer is started, it starts to count up by incrementing the TL register

- It counts up until it reaches its limit of FFH
- When it rolls over from FFH to 00, it sets high the TF (timer flag)

Contd.

- When the TL register rolls from FFH to 0 and TF is set to 1, TL is reloaded automatically with the original value kept by the TH register
- To repeat the process, we must simply clear TF and let it go without any need by the programmer to reload the original value
- This makes mode 2 an auto-reload, in contrast with mode 1 in which the programmer has to reload TH and TL

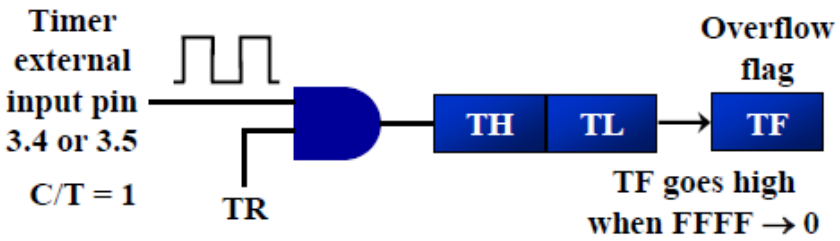
C/T Bit in TMOD Register

- The C/T bit in the TMOD registers decides the source of the clock for the timer
- When C/T = 1, the timer is used as a counter and gets its pulses from outside the 8051
- The counter counts up as pulses are fed from pins 14 and 15, these pins are called T0 (timer 0 input) and T1 (timer 1 input)

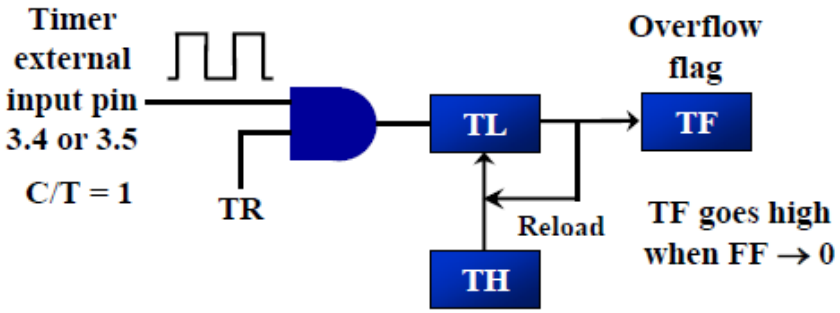
Pin	Port Pin	Function	Description
14	P3.4	T0	Timer/counter 0 external input
15	P3.5	T1	Timer/counter 1 external input

Contd.

Timer with external input (Mode 1)

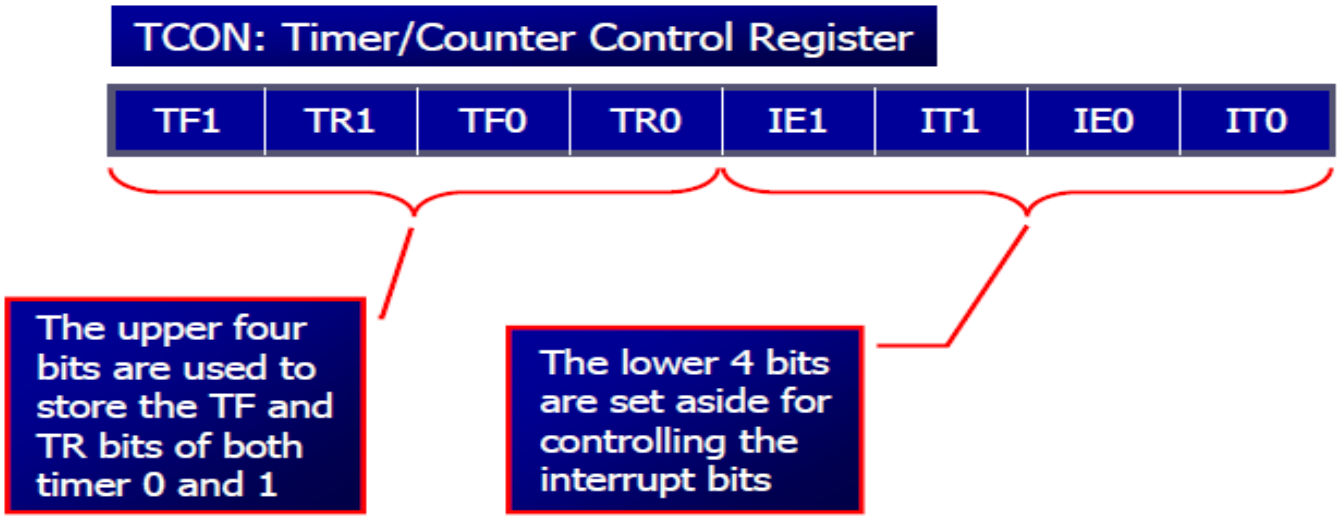


Timer with external input (Mode 2)



TCON Register

- TCON (timer control) register is an 8-bit register



Contd.

- TCON register is a bit-addressable register

Equivalent instruction for the Timer Control Register

For timer 0			
SETB	TR0	=	SETB TCON.4
CLR	TR0	=	CLR TCON.4
SETB	TF0	=	SETB TCON.5
CLR	TF0	=	CLR TCON.5
For timer 1			
SETB	TR1	=	SETB TCON.6
CLR	TR1	=	CLR TCON.6
SETB	TF1	=	SETB TCON.7
CLR	TF1	=	CLR TCON.7