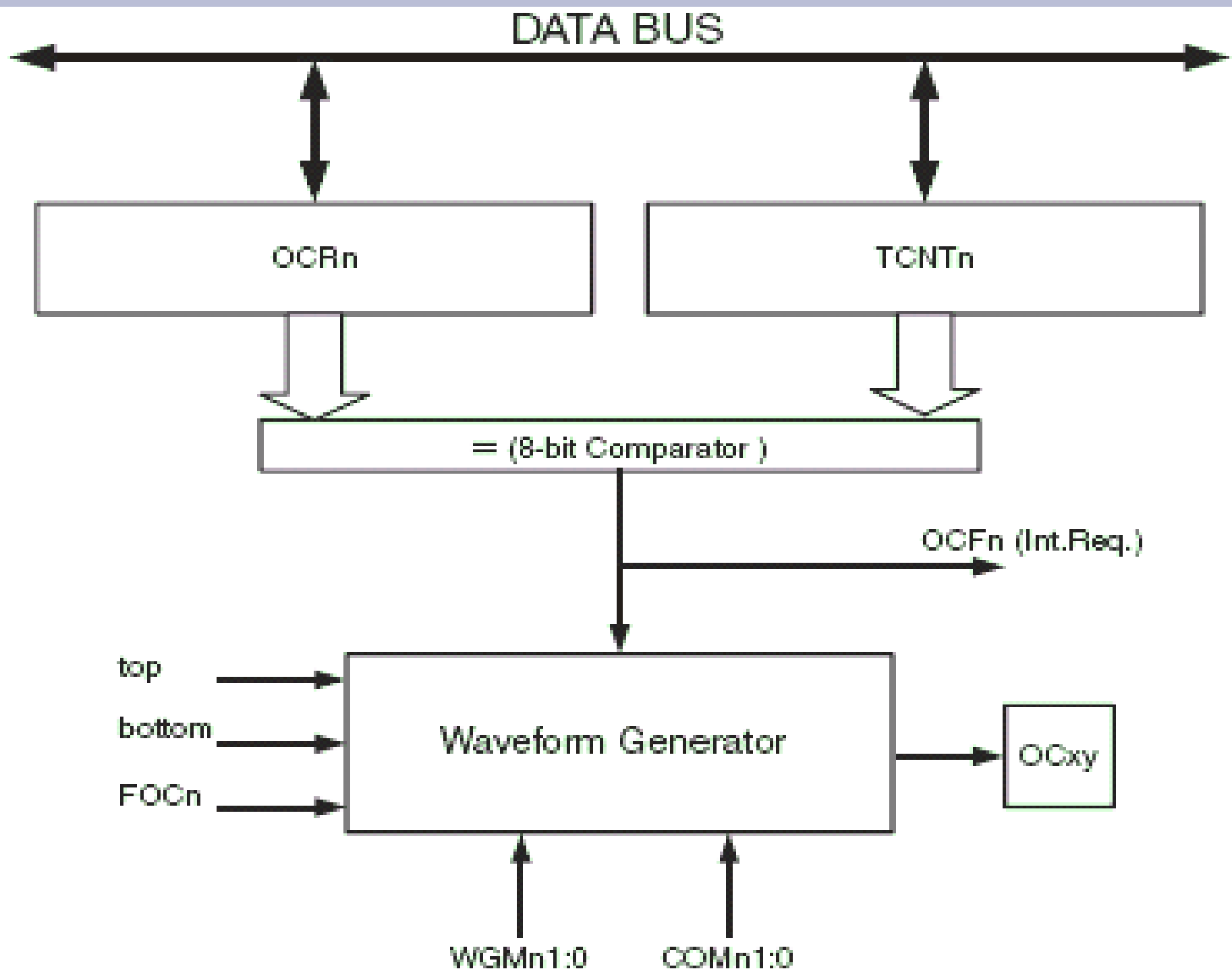


# Modes of operation of timers

- Normal mode : start the timer , as the timer reaches the maximum value it overflows ,generate the interrupt if enabled ,set the corresponding timer overflow flag .
- The timer will continue to run unless u stop it or u reach the end of the program

# compare mode & waveform generation

- There is a 8 bit comparator that continuously compares the value in the TCNT2 and OCR02 when ever TCNT2 equals OCR2 the comparator signals a match .
- it will set the corresponding flag
- will generate the interrupt if enabled







Bit	7	6	5	4	3	2	1	0	
	FOC2	WGM20	COM21	COM20	WGM21	CS22	CS21	CS20	TCCR2
Read/Write	W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	
Initial Value	0	0	0	0	0	0	0	0	

Mode	WGM21 (CTC2)	WGM20 (PWM2)	Timer/Counter Mode of Operation <sup>(1)</sup>	TOP	Update of OCR2	TOV2 Flag Set
0	0	0	Normal	0xFF	Immediate	MAX
1	0	1	PWM, Phase Correct	0xFF	TOP	BOTTOM
2	1	0	CTC	OCR2	Immediate	MAX
3	1	1	Fast PWM	0xFF	BOTTOM	MAX

# what are the two possibility that can happen ?

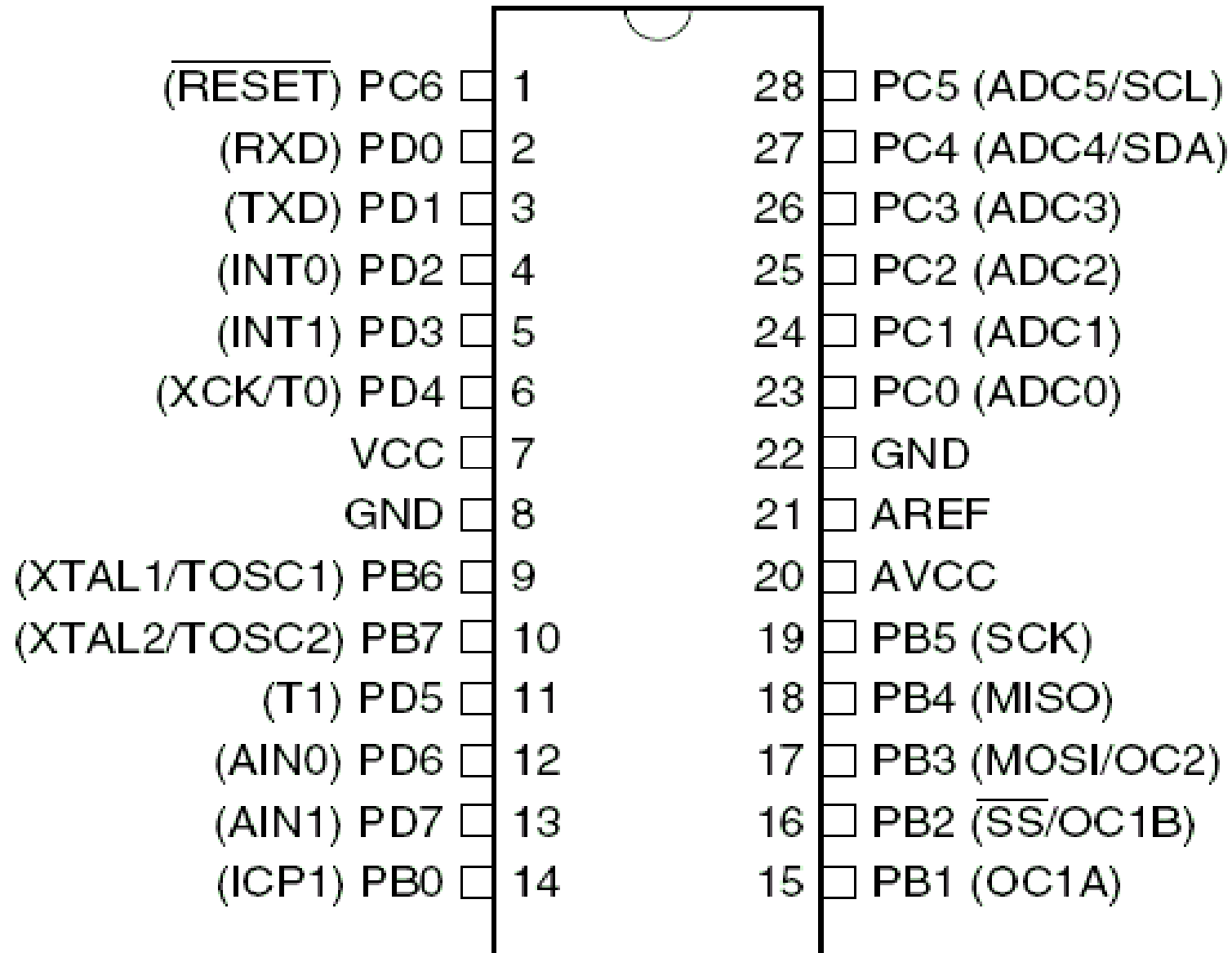
- When there is a match we can clear the contents of the TCNT2 . this is nothing but clear the timer on compare match mode .
- Let the timer run and overflow.

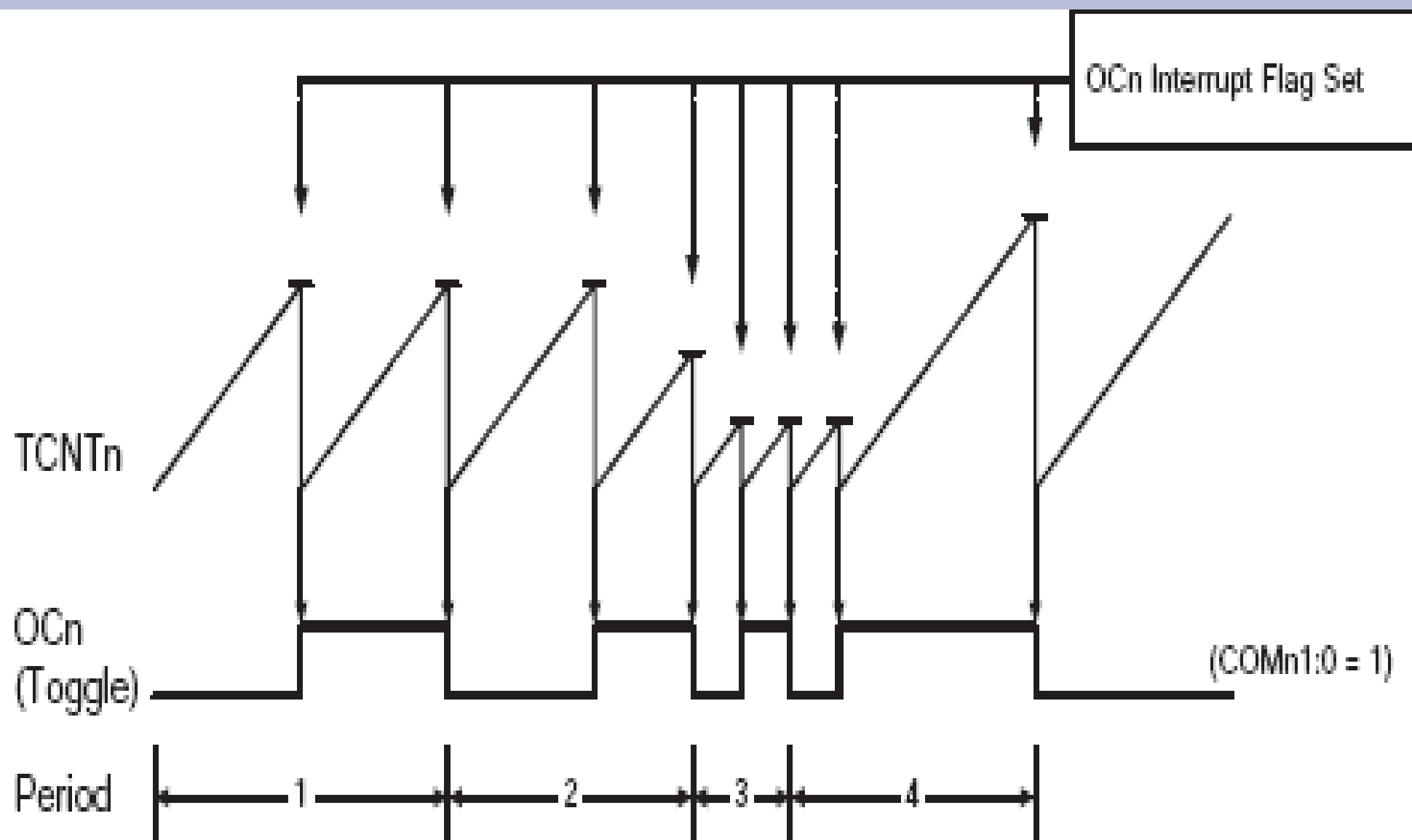
# Com bits

COM21	COM20	Description
0	0	Normal port operation, OC2 disconnected.
0	1	Toggle OC2 on Compare Match
1	0	Clear OC2 on Compare Match
1	1	Set OC2 on Compare Match



# PDIP





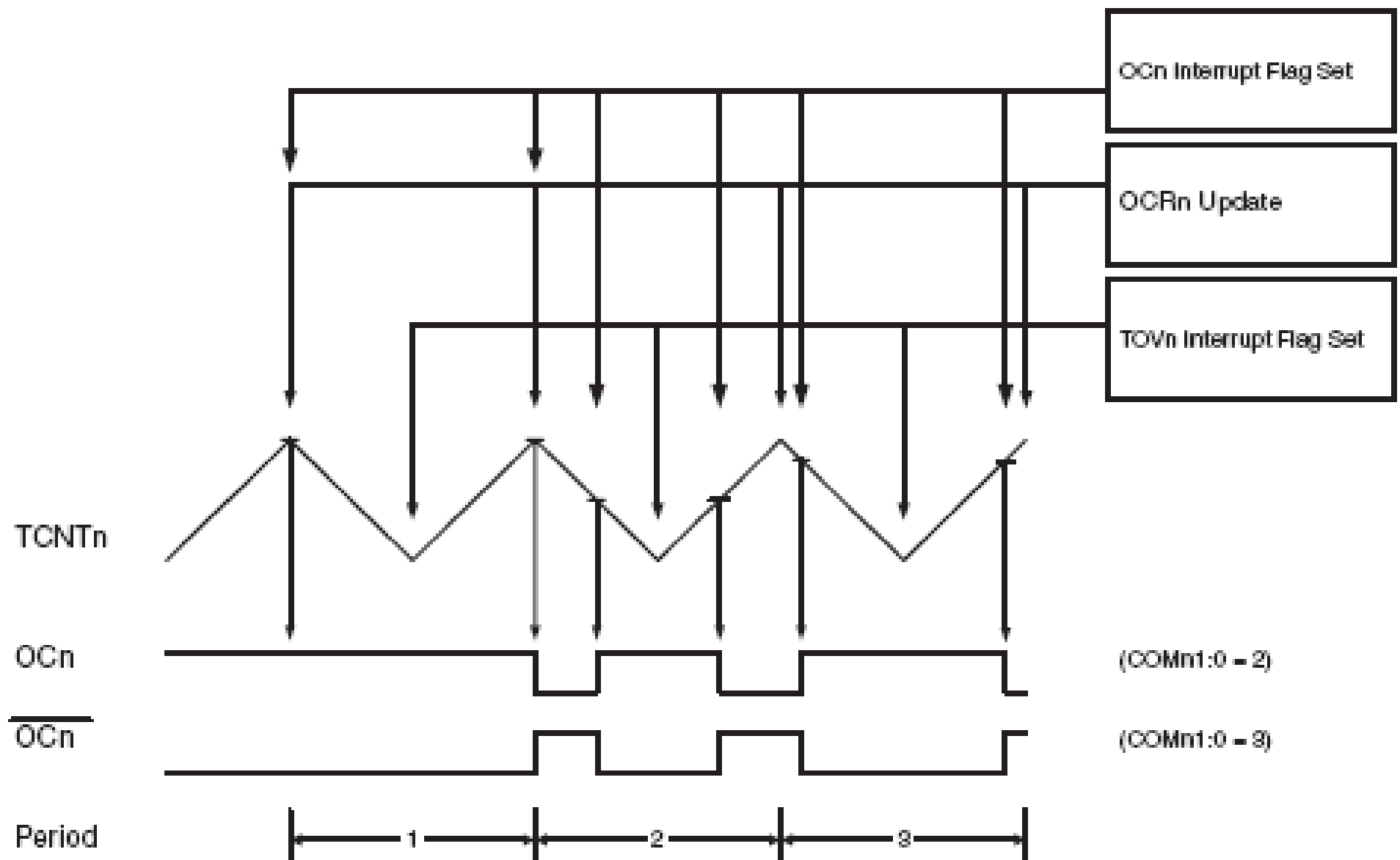
# Timers can also be used for PWM generation

- Fast PWM mode
- Phase correct PWM mode

# Phase correct PWM mode

- It is based on the dual slope operation
- The timer in this case act as count up & count down timer .
- The resolution is fixed to the 8 bits
- the timer overflow flag will be set when the timer reaches the bottom value .
- The pwm is generated on OC2pin.

Figure 40. Phase Correct PWM Mode, Timing Diagram



7	6	5	4	3	2	1	0	
FOC2	WGM20	COM21	COM20	WGM21	CS22	CS21	CS20	TCCR2
W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	

**Table 42.** Waveform Generation Mode Bit Description

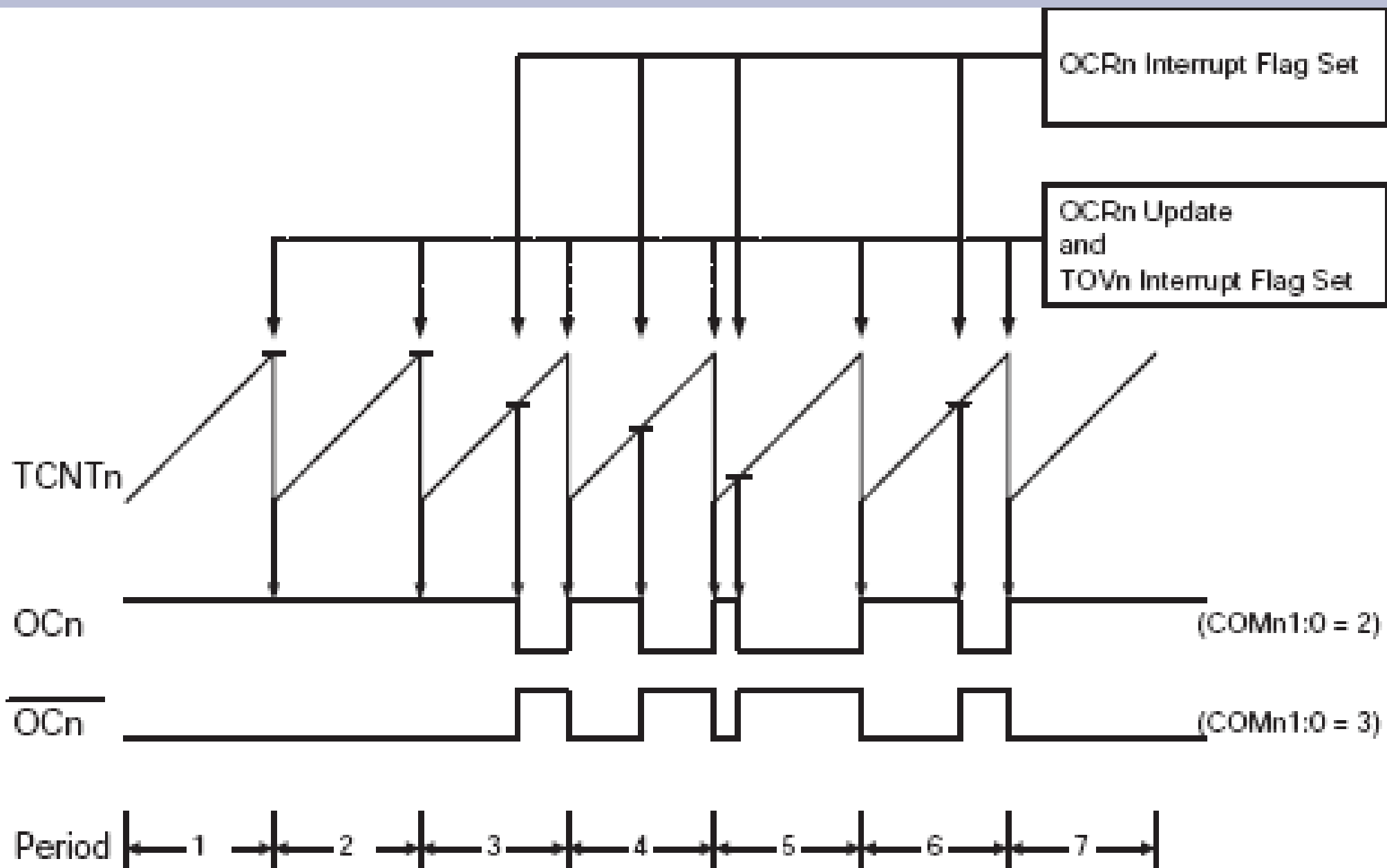
Mode	WGM21 (CTC2)	WGM20 (PWM2)	Timer/Counter Mode of Operation <sup>(1)</sup>	TOP	Update of OCR2	TOV2 Flag Set
0	0	0	Normal	0xFF	Immediate	MAX
1	0	1	PWM, Phase Correct	0xFF	TOP	BOTTOM
2	1	0	CTC	OCR2	Immediate	MAX
3	1	1	Fast PWM	0xFF	BOTTOM	MAX

**Table 45.** Compare Output Mode, Phase Correct PWM Mode<sup>(1)</sup>

COM21	COM20	Description
0	0	Normal port operation, OC2 disconnected.
0	1	Reserved
1	0	Clear OC2 on Compare Match when up-counting. Set OC2 on Compare Match when downcounting.
1	1	Set OC2 on Compare Match when up-counting. Clear OC2 on Compare Match when downcounting.

# Fast PWM

- It provides a high frequency PWM wave form generation .
- It has a single slope operation .
- The counter counts from bottom to max then then restart from bottom.





7	6	5	4	3	2	1	0	
FOC2	WGM20	COM21	COM20	WGM21	CS22	CS21	CS20	TCCR2
W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	

Mode	WGM21 (CTC2)	WGM20 (PWM2)	Timer/Counter Mode of Operation <sup>(1)</sup>	TOP	Update of OCR2	TOV2 Flag Set
0	0	0	Normal	0xFF	Immediate	MAX
1	0	1	PWM, Phase Correct	0xFF	TOP	BOTTOM
2	1	0	CTC	OCR2	Immediate	MAX
3	1	1	Fast PWM	0xFF	BOTTOM	MAX

COM21	COM20	Description
0	0	Normal port operation, OC2 disconnected.
0	1	Reserved
1	0	Clear OC2 on Compare Match, set OC2 at BOTTOM, (non-inverting mode)
1	1	Set OC2 on Compare Match, clear OC2 at BOTTOM, (inverting mode)

**Refer datasheet .>>>**

Page no. 104 – 120 for timer2(8 bit timer)