



UNIVERSIDAD AUTÓNOMA DE BAJA CALIFORNIA

Facultad de Ciencias Químicas e Ingeniería

Materia: Microprocesadores y Microcontroladores

Practica 9 Uso de Temporizadores/Contadores del uC ATmega1280

Docente:

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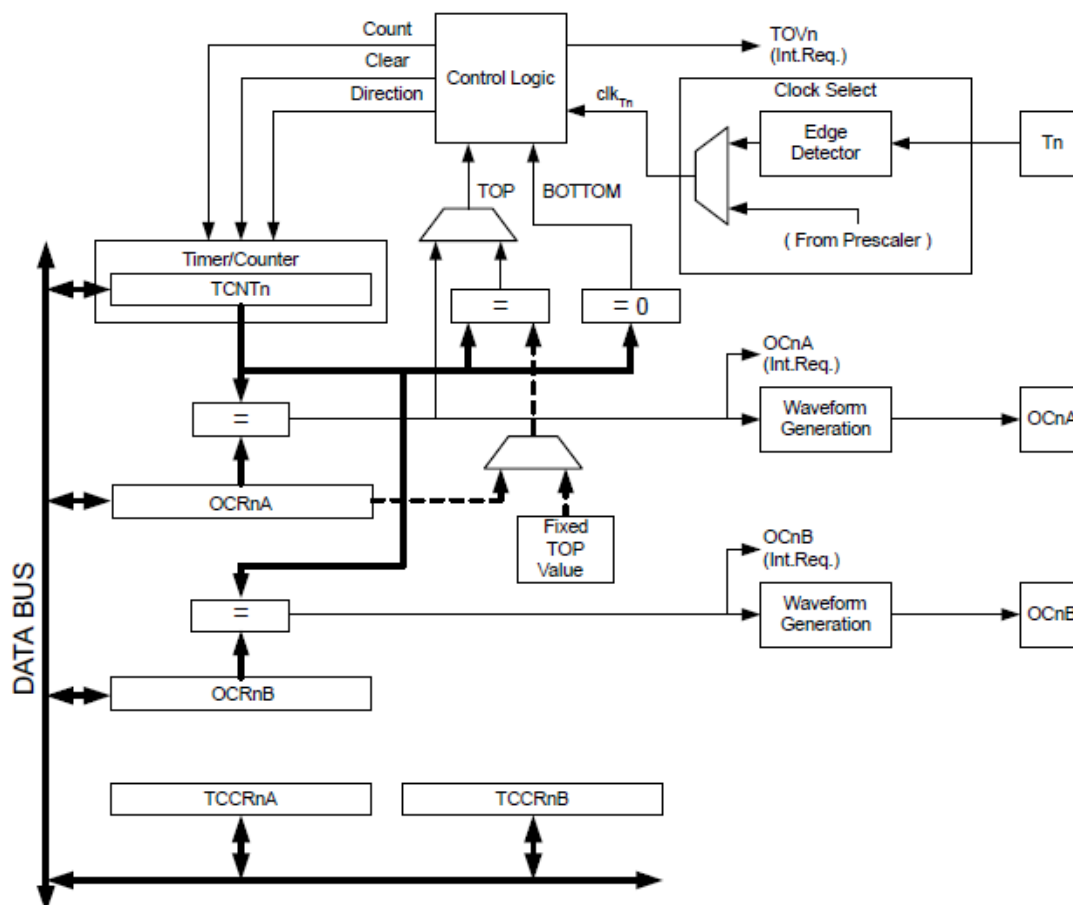
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Teoría

Las siguientes imágenes contiene los registros con sus respectivos bits utilizados para la programación de timer0.

Figure 16-1. 8-bit Timer/Counter Block Diagram



Name: TCCR0A

Offset: 0x44

Reset: 0x00

Property: When addressing as I/O Register: address offset is 0x24

Bit	7	6	5	4	3	2	1	0
	COM0A1	COM0A0	COM0B1	COM0B0			WGM01	WGM00
Access	R/W	R/W	R/W	R/W			R/W	R/W
Reset	0	0	0	0			0	0

Bits 1:0 – WGM0n: Waveform Generation Mode [n = 1:0]

Combined with the WGM02 bit found in the TCCR0B Register, these bits control the counting sequence of the counter, the source for maximum (TOP) counter value, and what type of waveform generation to be used. Modes of operation supported by the Timer/Counter unit are: Normal mode (counter), Clear Timer on Compare Match (CTC) mode, and two types of Pulse Width Modulation (PWM) modes (see [Modes of Operation](#)).

Table 16-9. Waveform Generation Mode Bit Description

Mode	WGM02	WGM01	WGM00	Timer/Counter Mode of Operation	TOP	Update of OCR0x at	TOV Flag Set on ⁽¹⁾⁽²⁾
0	0	0	0	Normal	0xFF	Immediate	MAX
1	0	0	1	PWM, Phase Correct	0xFF	TOP	BOTTOM
2	0	1	0	CTC	OCRA	Immediate	MAX
3	0	1	1	Fast PWM	0xFF	BOTTOM	MAX
4	1	0	0	Reserved	-	-	-
5	1	0	1	PWM, Phase Correct	OCRA	TOP	BOTTOM
6	1	1	0	Reserved	-	-	-
7	1	1	1	Fast PWM	OCRA	BOTTOM	TOP

Name: TCCR0B

Offset: 0x45

Reset: 0x00

Property: When addressing as I/O Register: address offset is 0x25

Bit	7	6	5	4	3	2	1	0
	FOC0A	FOC0B			WGM02		CS0[2:0]	
Access	R/W	R/W			R/W	R/W	R/W	R/W
Reset	0	0			0	0	0	0

Bits 2:0 – CS0[2:0]: Clock Select 0 [n = 0..2]

The three Clock Select bits select the clock source to be used by the Timer/Counter.

Table 16-10. Clock Select Bit Description

CS02	CS01	CS00	Description
0	0	0	No clock source (Timer/Counter stopped).
0	0	1	clk _{I/O} /1 (No prescaling)
0	1	0	clk _{I/O} /8 (From prescaler)
0	1	1	clk _{I/O} /64 (From prescaler)
1	0	0	clk _{I/O} /256 (From prescaler)
1	0	1	clk _{I/O} /1024 (From prescaler)
1	1	0	External clock source on T0 pin. Clock on falling edge.
1	1	1	External clock source on T0 pin. Clock on rising edge.

Name: TIMSK0

Offset: 0x6E

Reset: 0x00

Property: -

Bit	7	6	5	4	3	2	1	0
						OCIEB	OCIEA	TOIE
Access						R/W	R/W	R/W
Reset						0	0	0

Bit 1 – OCIEA: Timer/Counter0, Output Compare A Match Interrupt Enable

When the OCIE0A bit is written to one, and the I-bit in the Status Register is set, the Timer/Counter0 Compare Match A interrupt is enabled. The corresponding interrupt is executed if a Compare Match in Timer/Counter0 occurs, i.e., when the OCF0A bit is set in [TIFR0](#).

Name: TCNT0

Offset: 0x46

Reset: 0x00

Property: When addressing as I/O Register: address offset is 0x26

Bit	7	6	5	4	3	2	1	0
	TCNT0[7:0]							
Access	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Reset	0	0	0	0	0	0	0	0

Bits 7:0 – TCNT0[7:0]: TC0 Counter Value

The Timer/Counter Register gives direct access, both for read and write operations, to the Timer/Counter unit 8-bit counter. Writing to the TCNT0 Register blocks (removes) the Compare Match on the following timer clock. Modifying the counter (TCNT0) while the counter is running, introduces a risk of missing a Compare Match between TCNT0 and the OCR0x Registers.

Name: OCR0A

Offset: 0x47

Reset: 0x00

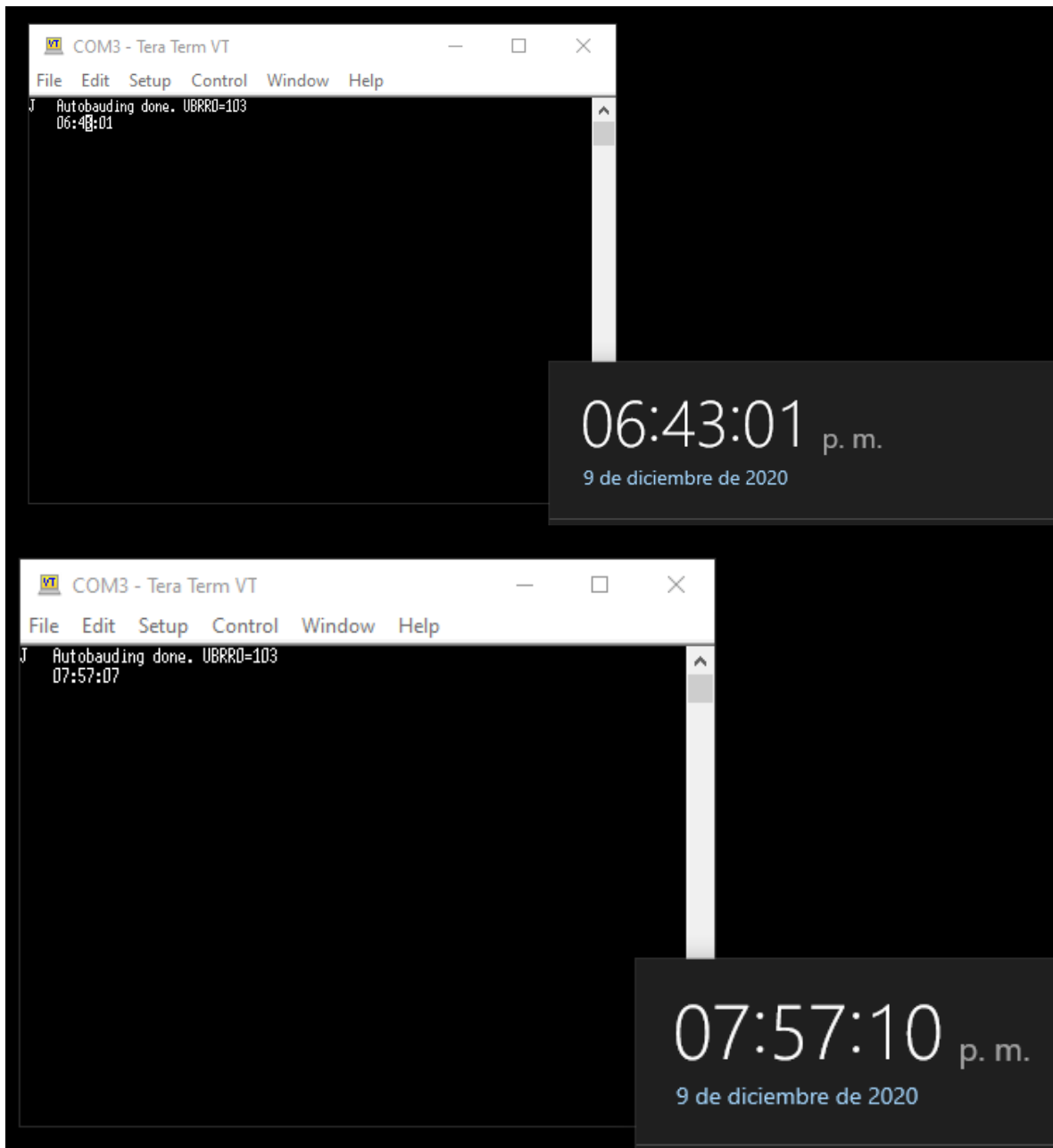
Property: When addressing as I/O Register: address offset is 0x27

Bit	7	6	5	4	3	2	1	0
	OCR0A[7:0]							
Access	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Reset	0	0	0	0	0	0	0	0

Bits 7:0 – OCR0A[7:0]: Output Compare 0 A

The Output Compare Register A contains an 8-bit value that is continuously compared with the counter value (TCNT0). A match can be used to generate an Output Compare interrupt, or to generate a waveform output on the OC0A pin.

Evidencia



Se presentó un desfase de 3 segundos aproximadamente.

Después de dejar correr el programa durante una hora, por favor responder la siguiente pregunta:
¿Por qué existe la diferencia de tiempo transcurrido? (Asumiendo que el temporizador fue configurado correctamente).

Debido a la ejecución de las interrupciones en la tarjeta arduino y del PC, y a los recursos que cada una posee, también el tiempo que se toma en atender los eventos generados por estas provoca el desfase.

Conclusión

Aprendí a configurar el timer0 haciendo uso de interrupciones, como aplicación puede decir que es importante y se puede usar, o para contar cuánto lleva encendido algún dispositivo y proceder a realizar cualquier actividad ya sea dormirlo, mandar un mensaje, o activar una bocina, etc.