Experiment 3

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Question 1

Design one digit timer 0 - 9:

Answer:

We need this following specification for 1s timer:

- Clock = 8MHz
- Timer= Timer1 - 16bit
  - Prescaler = 8
  - Overflow = 15
  - Reminder = 16960
  - This timer should count every 1s

For specify prescaler we need configure TCCR1B to 8 prescaler mode:

Bit	7	6	5	4	3	2	1	0	
	ICNC1	ICES1	–	WGM13	WGM12	CS12	CS11	CS10	TCCR1B
Read/Write	R/W	R/W	R	R/W	R/W	R/W	R/W	R/W	
Initial Value	0	0	0	0	0	0	0	0	

CS12	CS11	CS10	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 T1 pin. Clock on falling edge.
1	1	1	External clock source on T1 pin. Clock on rising edge.

Also we need to set timer1 overflow interrupt with TIMSK Register:

Bit	7	6	5	4	3	2	1	0	
	OCIE2	TOIE2	TICIE1	OCIE1A	OCIE1B	TOIE1	OCIE0	TOIE0	TIMSK
Read/Write	R/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	

For use 7seg with real number we need to convert that with bottom array:

```
char array[]={0xC0,0xF9,0xA4,0xB0,0x99,0x92,0x82,0xF8,0x80,0x90};
```

Resources:

- Atmel AVR Timer Calculator - Electrical
- AVR Timers - TIMER1 » maxEmbedded
- Avr Atmega 7 Segment Display Interfacing With Atmega16 32 | Avr A...

Question 2

Design 4 digit timer with timer 1 & 0

Answer:

Answer of This question is like question 1 but in this question we need an additional timer(0) for switching between 4-7segs.

We need this following specification for 1s timer:

- Clock = 8MHz
- Timer= Timer1 - 16bit
    - Prescaler = 8
    - Overflow = 15
    - Reminder = 16960

    - This timer should count every 1s

Also we need this specification for timer 0:

- Clock = 8Mhz
- Timer = Timer 0 - 8bit
    - Prescaler = 8
    - Overflow = 78
    - Reminder = 32
    - This timer should switch between 7seg every 0.02s

Resources:

- AVR Timers - TIMER0 » maxEmbedded