



- [Home](#)
- [Categories](#)
  - [Arduino](#)
  - [Componets](#)
  - [LED](#)
  - [News From the Web...](#)
  - [Parts](#)
  - [Photoshop Tutorials](#)
  - [Scooter Mods](#)
  - [Uncategorized](#)
- [Pages](#)
  - [About](#)
  - [Forum Signup](#)
  - [forums](#)
  - [Password Recovery](#)
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## Arduino Mega: PWM Pin and Frequency Timer Control

[Arduino](#)



**LOTS OF NEW UPDATES! These have all been personally Measured**

# By Myself!!

## Want to change the frequency on your your arduino mega?

I have painstakingly Spend many hours today going through every timer one by one and checking them on the Oscilloscope.

I can now accurately say these are all guaranteed within .05% precise...

A lot of this info is out there on the web but not much of it is all in one place and as easy to find as right here VS. Arduino's Forums.

Getting all this data together for my projects has taken me much effort since a lot of it was hard to completely understand when every place said refer to the datasheet.

That's great! The french in the data sheet says yes there are timer's and yes they can be changed, but there was no dumb dumb version in there to say , Do this, Type this here.

There is a lot of info on this for other boards like UNO etc.... but they don't work the same on the mega's.

Ok So.....

### Arduino mega pins and hardware Timers

<u>Pin</u>	<u>Timer</u>
46	OC5B
45	OC5B
44	OC5B
13	OC0B //Caution: this one directly effects major timing { i.e delay and millis}
12	OC1B
11	OC1A
10	OC2A
9	OC2B
8	OC4C
7	OC4B
6	OC4A
5	OC3A
4	OC0B //Caution: this one directly effects major timing { i.e delay and millis}
3	OC3C
2	OC3B

All that is really important above is the numbers. They tell you what timers there on.

For example pin 2 is OC3B which is timer 3.

another way to look at this is:

timer 0	— pin 4, 13	*there's alot of misinfo about Pin-13 but after checking 13 it is in fact on Timer 0 "Thx Max K."
timer 1	— pin 11, 12, 13	
timer 2	— pin 9, 10	
timer 3	— pin 2, 3, 5	
timer 4	— pin 6, 7, 8	
timer 5	— pin 44, 45, 46	

---

#### TIMER 0 (Pin 4, 13)

Value	Divisor	Frequency
0x01	1	62.5035 KHz
0x02	8	7.8125 KHz

0x03	64	976.5 Hz	// default
0x04	256	244.1 Hz	
0x05	1024	61.0 Hz	

Code: TCCR0B = (TCCR0B & 0xF8) | value ;

---

#### TIMER 1 (Pin 11, 12)

Value	Divisor	Frequency	
0x01	1	31.374 KHz	
0x02	8	3.921 KHz	
0x03	64	490.1 Hz	// default
0x04	256	122.5 Hz	
0x05	1024	30.63 Hz	

Code: TCCR1B = (TCCR1B & 0xF8) | value ;

---

#### TIMER 2 (Pin 9, 10)

Value	Divisor	Frequency	
0x01	1	31.374 KHz	
0x02	8	3.921 KHz	
0x03	32	980.3 Hz	
0x04	64	490.1 Hz	// default
0x05	128	245 hz	
0x06	256	122.5 hz	
0x07	1024	30.63 hz	

Code: TCCR2B = (TCCR2B & 0xF8) | value ;

---

Timers 3, 4, 5 Oddly do not use the divisors the data sheet says: Below are actual measured values!

#### TIMER 3 (Pin 2, 3, 5)

Value	Divisor	Frequency	
0x01	1	31.374 KHz	
0x02	8	3.921 Khz	
0x03	64	490.1 Hz	// default
0x04	256	122.5 Hz	
0x05	1024	30.63 Hz	

Code: TCCR3B = (TCCR3B & 0xF8) | value ;

---

#### TIMER 4 (Pin 6, 7, 8)

Value	Divisor	Frequency	
0x01	1	31.374 KHz	
0x02	8	3.921 Khz	
0x03	64	490.1 Hz	// default
0x04	256	122.5 Hz	
0x05	1024	30.63 Hz	

Code: TCCR4B = (TCCR4B & 0xF8) | value ;

---

#### TIMER 5 (Pin 44, 45, 46)

Value	Divisor	Frequency	
0x01	1	31.374 KHz	
0x02	8	3.921 Khz	
0x03	64	490.1 Hz	// default
0x04	256	122.5 Hz	
0x05	1024	30.63 Hz	

Code: TCCR5B = (TCCR5B & 0xF8) | value ;

---

To set your timer just add it to your sketch:  
Here's an example for Pins 9 and 10 on Timer 2 @ 490.1Hz;

```
void setup () {  
  TCCR2B = (TCCR2B & 0xF8) | 0x04;  
}
```

I know there is more that can be done with these And there are other ways as well but this is what i know works thus far.

Hope this is helpful to someone.



1. *Kristabelle* says:

[January 22, 2012 at 1:17 pm](#)

As Charlie Sheen says, this article is “WINNING!”

[Reply](#)



2. *nogdgmrgt* says:

[January 23, 2012 at 3:15 am](#)

f8Pt9G [ljpqjzfvllkh](#)

[Reply](#)



3. *TurboNick* says:

[February 26, 2012 at 3:25 pm](#)

Thank you for that information, it was very useful.

After testing out the other timers (3,4,5)

It looks like the divisor matches the frequency of Timer 2

1 31250 hz  
8 3926.25 hz  
64 488.28125 hz // default  
128 244.140625 hz  
1024 30.517578125 hz

[Reply](#)



- o *SobiGuy* says:

[February 26, 2012 at 5:52 pm](#)

Thank you TurboNick. I will check that out and add them to the list...

[Reply](#)



4. *Rasmus* says:

[April 2, 2012 at 9:43 am](#)

Very useful, thank you!

[Reply](#)




5. *Dante* says:

[May 24, 2012 at 3:30 am](#)

And how can i set arduino mega 2560 pin 9 and 10 to 20khz?


[Reply](#)

- o  [SobiGuy](#) says:  
[May 30, 2012 at 1:19 am](#)

Hey there! Dante,


I have started writing a nice walk through but,  
I Found a nice article covering the mega 2560.  
It explains exactly what pins your trying to change hope this helps.  
<http://arduino.cc/forum/index.php?topic=72092.0>

[Reply](#)

6.  [Carlan](#) says:  
[September 21, 2012 at 8:12 am](#)


Thank you so much for figuring this out and posting the information!  
It works great and I am sure you have saved me a few hours of work.

[Reply](#)

7.  [Max K.](#) says:  
[April 1, 2013 at 1:07 pm](#)

Thanks for the information! It saved me a lot of time.  
But I think there is a small error:  
Pin13 belongs to Timer0 and not to Timer1.  
I monitored the PWM-output of Pin13 with an oscilloscope. The frequenz of Pin13 didn't change until I set the register of Timer0. Bevore that, I have set the registers of all other timers.  
My board verion is R3.


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8.  [SobiGuy](#) says:  
[April 1, 2013 at 10:53 pm](#)

Thx Max K,  
I spent a Special Day Check each and very one on the Oscilloscope. And turns out you are right. I made the changes above. I also took the time to check timers 3, 4, 5. As What I have before was no check for myself but given to me by turbo nick. Turns out they were all Wrong. As the the Divisor's were all inaccurate. They are all Confirmed myself now!

Again Thx Max for getting me off my lazy bum and finally getting these all Checked..  
SobiGuy

[Reply](#)

9.  [Shahd](#) says:  
[July 22, 2013 at 8:16 am](#)

Hi thankx informative stuff

But one question can we generate the frequency what we want or we cannot do anything other then u said like  
I want to control 4 transistors they have different switching frequencies so for this i need 4 output from micro controller all with different frequencies...  
adjustable duty cycle ofcourse..

Frequencies like: 20K , 2K, 100 to 200 HZ

[Reply](#)



10. *Sergio* says:

[November 3, 2013 at 5:55 am](#)

I have a question...I'm a noob :D. If I change timer 4 in order to use pins 7 and 8 as pwm output:

```
TCCR4B=(TCCR4B&0xF8)|0x02;
```

after that, in the loop can I use the analogWrite() function normally? And what about the millis() function?

[Reply](#)



11. *Fernando Garcia* says:

[March 1, 2014 at 6:58 pm](#)

Hi!

You have some errors.

```
46 = OCRA;
```

```
45 = OCRB;
```

```
44 = OCRC.
```

Best regards.

[Reply](#)



12. *Fernando Garcia* says:

[March 1, 2014 at 6:59 pm](#)

Hi!

You have some errors.

```
46 = OCR5A;
```

```
45 = OCR5B;
```

```
44 = OCR5C.
```

Best regards.

[Reply](#)



13. *ilan* says:

[January 5, 2015 at 11:22 am](#)

Thank you, thank you, Nathan.

Great post here, huge value for lazy people like me.

[Reply](#)



14. *Stefan* says:

[June 10, 2015 at 8:23 am](#)

Hi,

I need some help. i have 2 libraries that use one timer, How can I change the timer on one of them. This is the function that use a timer.

```
prescaler = _timer_calc(speed, (uint16_t)-1, &nticks);  
if (!prescaler)  
{  
return; // fault
```

```

}

TCCR1A = 0; // Output Compare pins disconnected
TCCR1B = _BV(WGM12); // Turn on CTC mode

// convert prescaler index to TCCRnB prescaler bits CS10, CS11, CS12
TCCR1B |= prescaler;

// Caution: special procedures for setting 16 bit regs
// is handled by the compiler
OCR1A = nticks;
// Enable interrupt
#ifdef TIMSK1
// atmega168
TIMSK1 |= _BV(OCIE1A);
#else
// others
TIMSK |= _BV(OCIE1A);
#endif // TIMSK1

#endif // __AVR_ATtiny85__

// Set up digital IO pins
pinMode(vw_tx_pin, OUTPUT);
pinMode(vw_rx_pin, INPUT);
pinMode(vw_ptt_pin, OUTPUT);
digitalWrite(vw_ptt_pin, vw_ptt_inverted);
}

#endif // ARDUINO

```

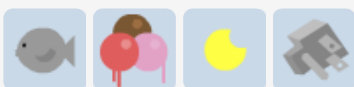
thanks in advance

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