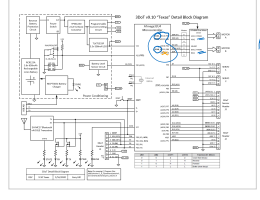
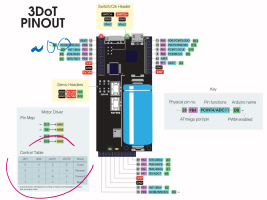


Review or where to find your book

<https://www.amazon.com/dp/B001881818>  
Roberts/robotics-sheets/  
32-bit Block Diagram v450-E41-MCY7 Texas



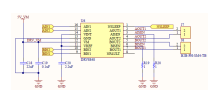
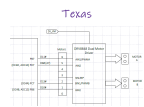
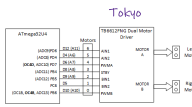
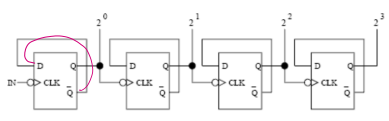
ASD

### 3214 Timer/Counter Review

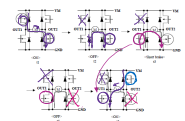
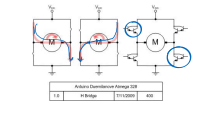
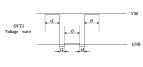
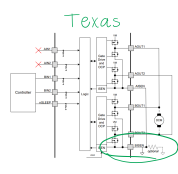
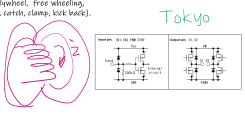
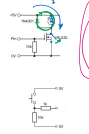
[http://web.csuohio.edu/~billce346/Lectures/04%20-%20ATmega3214\\_Timers.pdf](http://web.csuohio.edu/~billce346/Lectures/04%20-%20ATmega3214_Timers.pdf)

Q10: Review Material  
<http://web.csuohio.edu/~billce444/05course%20Material/papers>

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0000\_0100  
0000\_0101  
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Pinback diode (aka flywheel, free wheeling, snubber, suppressor, catch, clamp, kick back).



Tokyo Truth Table

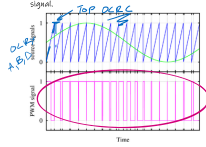
IN	EN	DIR	OUT	Mode
0	0	0	0	Stop
0	0	1	0	Stop
0	1	0	0	Forward
0	1	1	1	Reverse
1	0	0	0	Stop
1	0	1	1	Forward
1	1	0	0	Reverse
1	1	1	1	Stop

### Texas Truth Table

Texas Truth Table

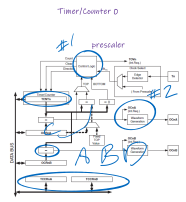
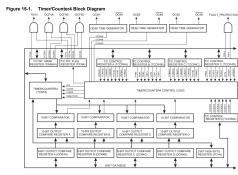
Pin State	Motor Driver
0 0	Stop
0 1	Forward
1 0	Reverse
1 1	Stop

The PWM version of the signal has a fixed frequency defining the point when a pulse begins. During the period of an individual pulse, the signal remains high for an amount of time proportional to the amplitude of the analog signal.



side work

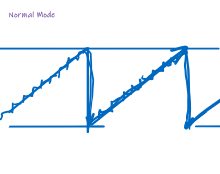
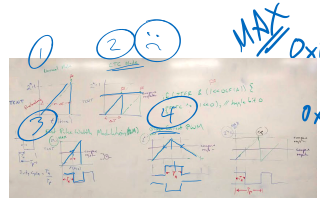
Arduino... analogwrite() Changing the duty cycle of a digital square wave



### Arduino Timer

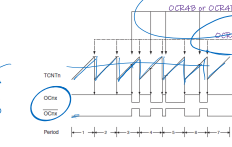
Timer/Counter0 is an 8-bit Timer/Counter module, with two independent Channel Comparators (CCs) and with PWM support. The dedicated Timer 0 to implement the delay(), millis() and Servo library functions.  
Timer/Counter1 and Timer/Counter3 are 16-bit Timer/Counter units with three independent Channel Comparators.  
Timer/Counter4 is the only 16-bit high speed timer on the ATmega3214 and has a lot of advanced features, including a high precision mode, double buffering (no jitter), dead time (break before make), fault protection with noise canceling (motor stall monitoring), and even support for brushless DC motors. To keep things simple we will not be using any of those features.

#1 How do we control the timer  
#2 How do we control the output



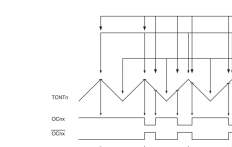
### Fast Pulse Width Modulation

Fast PWM: The counter matches the TOP value at the end of the counting cycle. The counter is then cleared and the counting cycle begins again. The hardware compares the counter value to the TOP value and generates a square wave output. The hardware compares the counter value to the TOP value and generates a square wave output.



The timing diagram for the fast PWM mode is shown in Figure 16-3. This counter is cleared when the counter value matches the TOP value. The counter is then cleared and the counting cycle begins again. The hardware compares the counter value to the TOP value and generates a square wave output. The hardware compares the counter value to the TOP value and generates a square wave output.

### Phase Correct PWM



OCR4C sets frequency  
duty cycle?