DC Motor speed Control using PWM

PWM is a technique where the amount of power delivered to a load (DC motor) is controlled by **varying the width of the pulse** while keeping the frequency constant.

Duty Cycle: The percentage of time the pulse is ON in one period.

$$\text{Duty Cycle (\%)} = \left(\frac{T_{ON}}{T_{ON} + T_{OFF}} \right) \times 100$$

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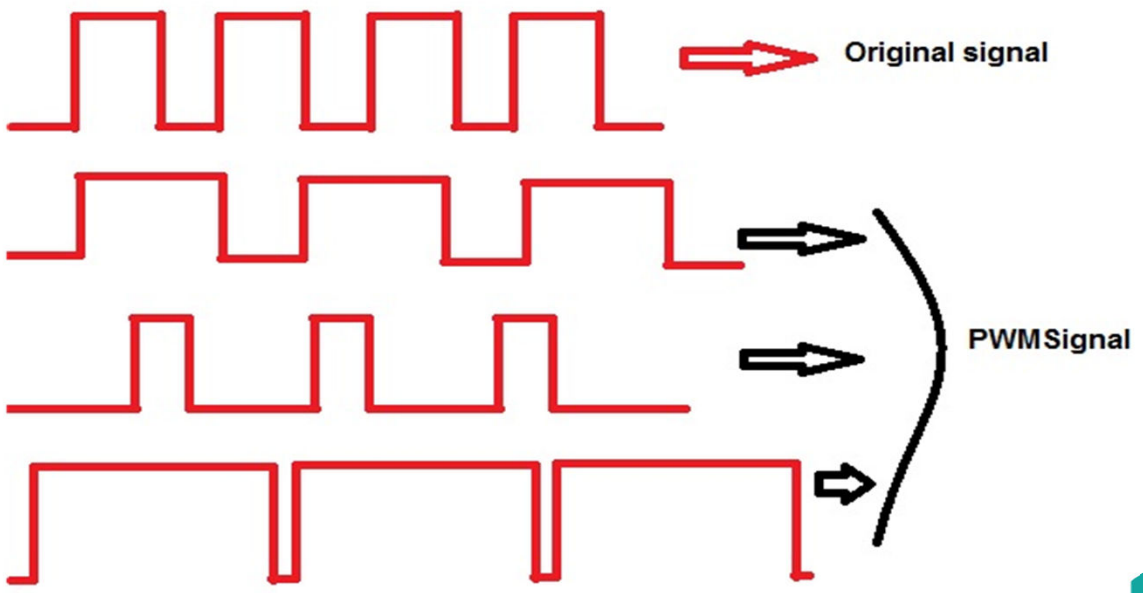
Duty cycle effects:

- 100% → Motor runs at full speed.
- 50% → Motor runs at half speed.
- 0% → Motor stops.



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- We you can use 8051 timers as 16-bit.
- To load 16-bit value in timers you use two registers THx and TLx associated with timers.
- Where THx represents Timer High Byte and TLx represents Timer Low Byte

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Example 1

Calculation of Timer 0 reload value needed to achieve timer delay of 20 ms. Oscillator frequency is 11.0592 MHz.

Delay Value = *Timer Delay / Timer Clock Cycle Duration*

$$= \frac{20 \times 10^{-3}}{\frac{6}{11.0592 \times 10^{6}}}$$

= *36864 (must be rounded to the nearest integer)*

Timer Reload Value = *Maximum Register Count - Delay Value*

= *65535 – 36864*

= *28671*

= *0x6FFF*

so Timer 0 is loaded with:

```
TH0 = 0x6F;
TL0 = 0xFF;
```

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