Freq of oscillator = 22.1184 MHz/12 = 1.8432 MHz

Time for one cycle = 1/1.8432 MHz = 0.5425 µs

Freq of square wave = 500Hz

Time of square wave = 1/500Hz = 2ms

Time for +ve portion = 2ms \* Duty Cycle

No of cycles for +ve = Time for +ve portion/Time for one cycle

Time for -ve portion = 2ms - Time for +ve portion

No of cycles for -ve = Time for -ve portion/Time for one cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Duty Cycle** | **Time for +ve portion (ms)** | **No. of cycles for +ve portion** | **Time for -ve portion (ms)** | **No. of cycles for -ve portion** | **Expected voltage** |
| 20% | 2 \* 20% = 0.4 | 400 / 0.5425 = 737 | 2 – 0.4 = 1.6 | 1600 / 0.5425 = 2949 | 0.66v |
| 25% | 2 \* 25% = 0.5 | 500 / 0.5425 = 922 | 2 – 0.5 = 1.5 | 1500 / 0.5425 = 2765 | 0.825v |
| 50% | 2 \* 50% = 1 | 1000 / 0.5425 = 1843 | 2 – 1 = 1 | 1000 / 0.5425 = 1843 | 1.65v |
| 75% | 2 \* 75% = 1.5 | 1500 / 0.5425 = 2765 | 2 – 1.5 = 0.5 | 500 / 0.5425 = 922 | 2.475v |
| 80% | 2 \* 80% = 1.6 | 1600 / 0.5425 = 2949 | 2 – 1.6 = 0.4 | 400 / 0.5425 = 737 | 2.64v |

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| --- | --- | --- | --- |
| **No of cycles** | **Timer initial value** | **TH0** | **TL0** |
| 737D = 2E1H | FFFF - 2E1 + 1 = FD1F | FD | 1F |
| 922D = 39AH | FFFF - 39A + 1 = FC66 | FC | 66 |
| 1843D = 733H | FFFF - 733 + 1 = F8CD | F8 | CD |
| 2765D = ACDH | FFFF - ACD + 1 = F533 | F5 | 33 |
| 2949D = B85H | FFFF - B85 + 1 = F47B | F4 | 7B |