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Section 3.2

Week 12 Lab Report: Free Lab 3

Lab Report Rubric

Category	Student Score	Grader Score
Organization		
Appropriate sections	1/1	/1
Appearance and formatting	2/2	/2
Spelling, grammar, sentence structure	1/1	/1
Work		
Experimental procedure	1.5/2	/2
Results (data, code, figure, graph, tables, etc.)	1.5/2	/2
Conclusion	1.5/2	/2
Total	**8.5/10**	**/10**

Introduction

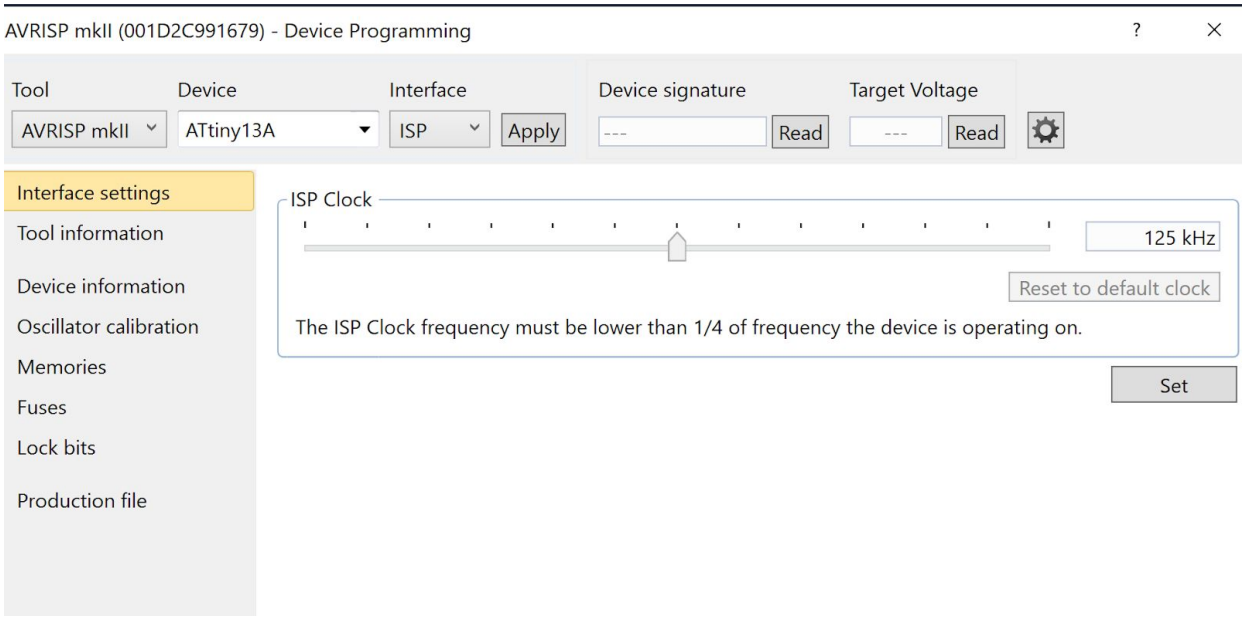
Today I worked on uploading the code from the previous lab and connected it to the piston via a mosfet transistor. I then looked up info on the 555 timer circuit. I learned how it worked and then got it working as an astable oscillator.

Procedure

Flashing the file

getting the file onto the Attiny wasn't too bad, all I had to do was select the correct.

I kept getting an error because my reset pin was not connected to the other reset pin.



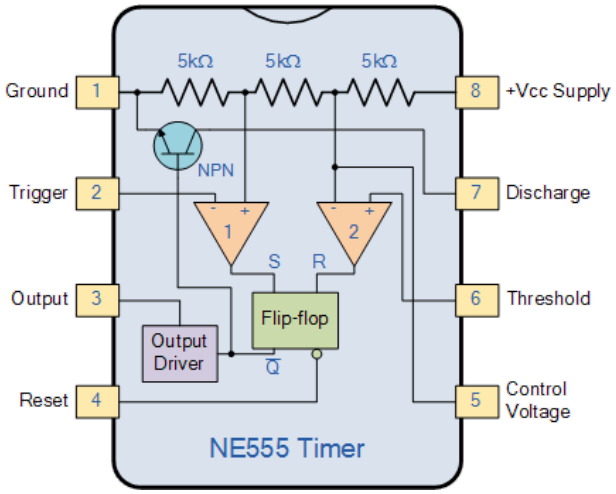
The main screen for device programming, go into memories and then press program

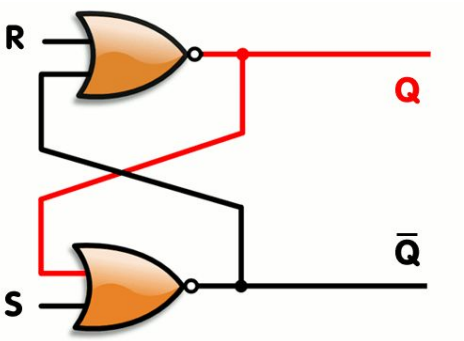
555 Timer circuits - [Good Video]

In order to learn more about electronics I thought it would be good to learn more about the 555 timer circuit and understand the main aspects of it.

The main components are the flip flop and the comparators

The three 5 ohm resistors make up a voltage divider circuit for the comparators to use as references





The flip flop has 4 pins R,S and Q,NQ

It in practice, stores a value from R or S and hold the value on Q and also has the not of Q (the one with the overline)

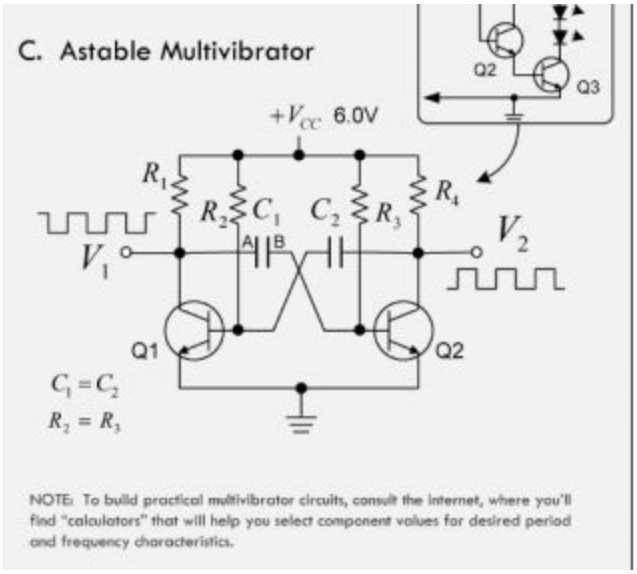
Comparators

Returns 1 if +'s voltage is greater than -'s voltage or 0 if -'s voltage is greater than +'s voltage

This means that if the capacitor is charged than the comparators would return true

Whenever the output for the flip flop is high the discharge pin is connected to ground (for discharging the timing capacitor)

http://instrumentacion.qi.fcen.uba.ar/libro/Scherz.pdf - book link



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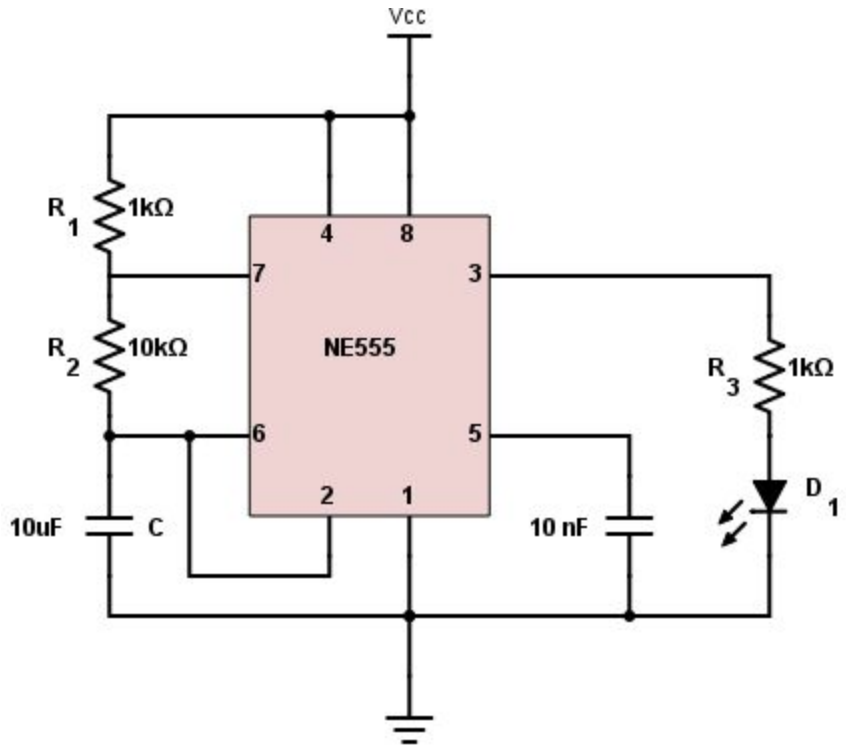
I learned how an astable oscillator works from the book Practical Electronics for Inventors. I mostly skimmed over the further chapters but I remembered the shape of the circuit and how it looked similar to the 555 timer and looked up again.

A 555 isn't just astable though, it also can be monostable or bistable.

C. An asatable multivibrator is a circuit that is not stable in either of two possible output states and it acts like an oscillator. It also requires no external trigger pulse, but uses positive feedback network and a RC timer network to create built-in triggering that switches the output between V_{CC} and 0V. The result is a square wave frequency generator. In the circuit to the left, Q1 and Q2 are switching transistors connected in cross-coupled feedback network, along with two time-delay capacitors. The transistors are biased for linear operation and are operated as common emitter amplifiers with 100% positive feedback. When Q1 is OFF, its collector voltage rises toward V_{CC}, while Q2 if ON. As this occurs, plate A of capacitor C_1 rises towards V_{CC}. Capacitor C_1's other plate B, which is connected to the base of Q2 is at 0.6V since Q2 is in conducting state, thus the voltage across C_1 is 6.0 – 0.6V = 5.4V. (It's high value of charge). The instant Q1 switches ON, plate A of C_1 falls to 0.6V, causing an equal and instantaneous fall in voltage on plate B of C_1. C_1 is pulled down to –5.4 (reverse charge) and this negative



basic astable circuit (found online)

After going over everything I thought it was time to build a circuit. It took a while because apparently I had broken the IC in the past and didn't notice because the discharge pin wasn't working.

I figured this out because the LED seemed to turn on when you first plugged it in (as the capacitor was charging). I then used a multimeter to check the voltage across the capacitor and it was about vcc voltage with no fluctuation. I then shorted the discharge pin to 0 and the led turned back on. I then decided to replace the IC with a new one and everything worked as intended.

https://www.youtube.com/watch?v=sAvJsMQsOR0

Results

Results

I learned a lot about electronics in this lab. I find the understanding of all the states of a circuit to be the hardest thing and have have trouble in the past with understanding how synchronous everything is in a circuit. I did learn about more basic components such as comparators and also about how to go about debugging a circuit. I also got the piston connected to the relays and the Attiny so I will be working on the analog inputs next week.

Conclusions and Reflection

In the lab when learning about the 555 timer circuit I remembered how different electrical engineering is because you have to think in a much different way than in programming. In programming you think very linearly because it is based on cycles or lines of code that follow one after the other. Circuit design requires that you can think more as states and be able to look at the entire circuit.