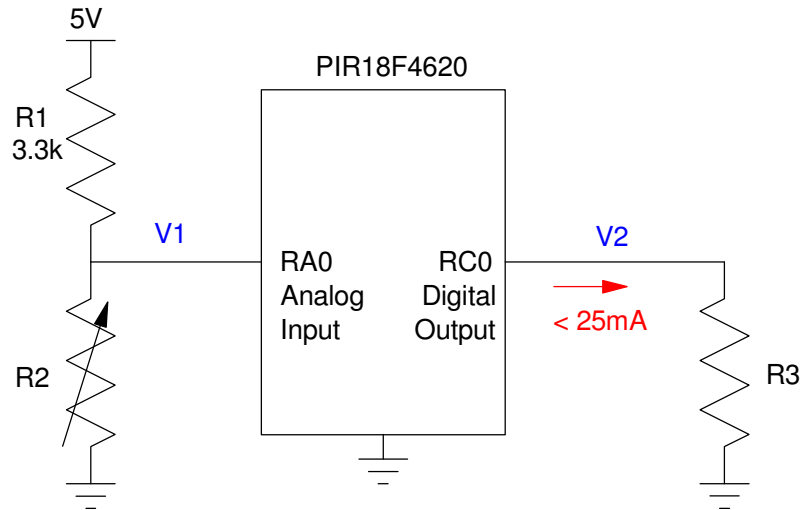


ECE 376 - Homework #1

PIC Background

Due Wednesday, January 17th via email, Blackboard, or hard copy

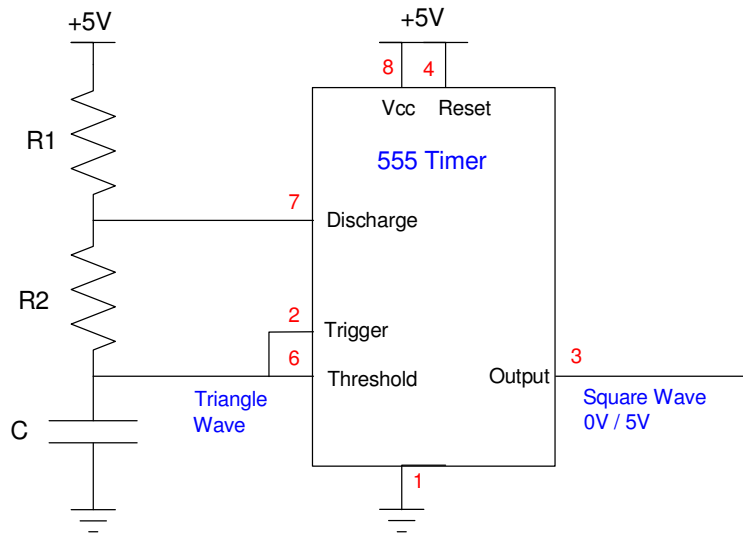
Problem	Answer
1) How many clocks does it take to write the LCD display? • Check Homework #9 solutions for Spring 2023	
2) A PIC's output is limited to 25mA. Assuming V2 is 5V, what is the smallest resistance you can connect to the output? (how small can R3 be?)	
A PIC can measure voltage to 4.88mV. To give an idea of how small this is....	
3) What is the smallest change in R2 a PIC can measure if R2 = 2000 Ohms nominally? • How much does R2 have to change from 2000 Ohms for V1 to change by 4.88mV?	
4) Assume R2 is a thermistor. • What temperature is it if R2 = 2000 Ohms? • How much does the temperature have to change for V1 to change by 4.88mV?	
A PIC can measure time to 100ns. To give an idea of how small this is....	
5) The average NFL quarterback can throw a football 87 km/h. How far does the football travel in 100ns?	
6) Assume for the 555 timer • R1 = 1k, R2 = 2k, C = 0.1uF • What frequency does the 555 timer output on pin #3?	
7) What is the smallest change in frequency a PIC can detect? • i.e. how much does the frequency have to change for the period to change by 100ns?	
8) With this circuit, you can build an Ohm-meter (replace R2 with the resistance to be measured.) Assume R2 = 2000 Ohms (nominally). How much does R2 have to change for the period to change by 100ns? • i.e. What is the resolution of this circuit when used as an Ohm-meter?	
9) Replace R2 with a thermistor which reads 2000 Ohms nominally. How much does the temperature have to change for the period to increase by 100ns? • i.e. what is the resolution in degrees C?	



Problem #1 to #3

If R2 is a thermistor, assume

$$R_2 = 1000 \cdot \exp\left(\frac{3905}{T+273} - \frac{3905}{298}\right) \Omega$$



Astable 555 Timer: Problems 5-8

The square wave at the Output has a period of $T = (R_1 + 2R_2) \cdot C \cdot \ln(2)$ seconds