Final Project Problem Statement

GOAL:

The Goal for this project was to design and implement one noise filtering circuit for non-ideal push button. The design can only include any analog and digital component available to us in the school’s laboratory. The design cannot include any Arduino or equivalent components in the circuit. The 0V and 3.3V with the low input threshold being a maximum 0.4V and the high input threshold being minimum 2.0V. The minimum resistors that can be utilized for the creation of this circuit must be minimum 1kOhm.

We must create the design in Multisim and Simulate design in Multisim for both transient analysis and DC. In addition to this we must also implement the design on breadboard and perform bench verification. Once this is completed, we verify the design and record the Oscilloscope capture.

DESIGN:

In Multi-Sim, to simulate the bouncing button I used a square wave generator with the input voltage of 0 and 3. I connected to a the voltage source a voltage controlled spst bouncing trigger to give it the emulation of an imperfect button press connected to an 1 milli-amp current source that gave resistance. After checking to make sure that circuit respond correctly, I used a various other circuits to try to de-bounce the signal. The one that was most successful was a peak detector circuit. A peak detector circuit is an op-amp circuit that detects the peak of its input voltage and stores that peak voltage on a capacitor.

To create the circuit, I used a 741 op-amp and connected 5V Vcc. Any less and the detection will not show the 3.3v needed. To the output of the op-amp a diode was placed in forward bias and connected to a 1uF capacitor. The other end of the capacitor is then connected to a 2k resistor and then connected to the inverting input. To the non-inverting input another 2k resister was placed and then connected to the bouncing circuit. After connecting the oscilloscope, I was getting the proper output of 3.3V

CALCULATIONS:

Vcap= Vinitial (e^-t/RC)

Vcap= Voltage across capacitor

Vinitial= Voltage initially across capacitor

t= time

R and C = Resistor and Capacitor values

Charging the capacitor

Vth= Vfinal(1-e^-t/RC)

Vth= worst case transition point for high signal

Vfinal = final charged value – power supply in circuit