TESTING THE DEBOUNCING PROPERTIES OF THE RC FILTER

Now that we have built the circuit, you can test the debouncing properties of the RC filter. Plug the USB cable into your chipKIT™ board and program it with code from Debouncing via Software. Once your board is programmed, the external LED should start blinking.

Remove the capacitor from the circuit; it's okay to do this while the circuit has power. We know it's okay to do this because we understand how it will affect the circuit. Removing the capacitor is essentially replacing it with a gap in the circuit. Since nothing can flow across this gap, more current will be diverted through the resistor that was in parallel with the capacitor. Similarly, once the capacitor has been charged in the circuit, it does not allow any current to flow through it. At this point, the capacitor will essentially act as a gap. After you have removed the capacitor, pressing the button enough times should eventually cause button bounce and make the LED glow dimly (instead of blinking). Tapping or flicking the button accomplishes effectively the same thing. Once you are able to reproduce the bounce consistently, try sticking the capacitor back in the circuit. Be sure you **put the capacitor back exactly as shown** in Fig. 1 (with the white stripe terminal on the capacitor connected to ground).

If you reconnect the capacitor with the wrong polarity, it may damage your component. With the capacitor in place you, should not be able to get the button to bounce even if you flick or tap it.

To see what the circuit is actually doing, see Fig. 2. It shows what the button signal looks like with the capacitor absent from the RC filter. In Fig, 3, the same signal is shown magnified 100x, so that you can clearly see the noise caused by a button bounce. Finally, Fig. 4 depicts what the button signal looks like after the capacitor is replaced within the circuit.

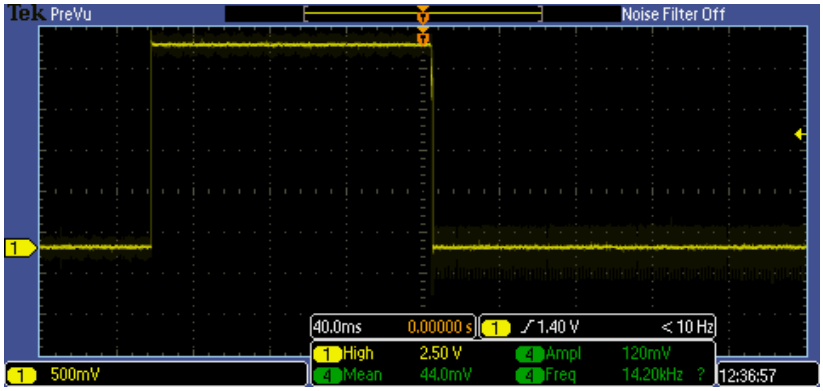

Figure 2. Button signal without a capacitor.

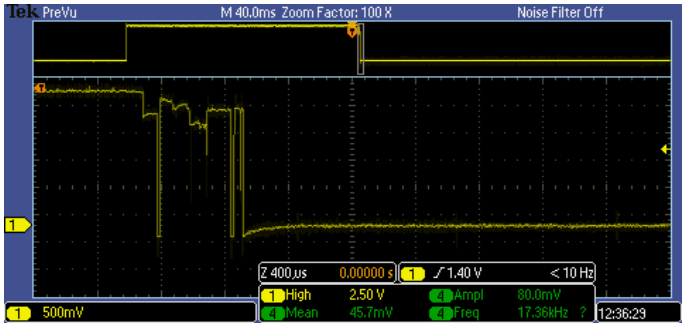

Figure 3. Bounce noise present in button signal at 100x zoom.

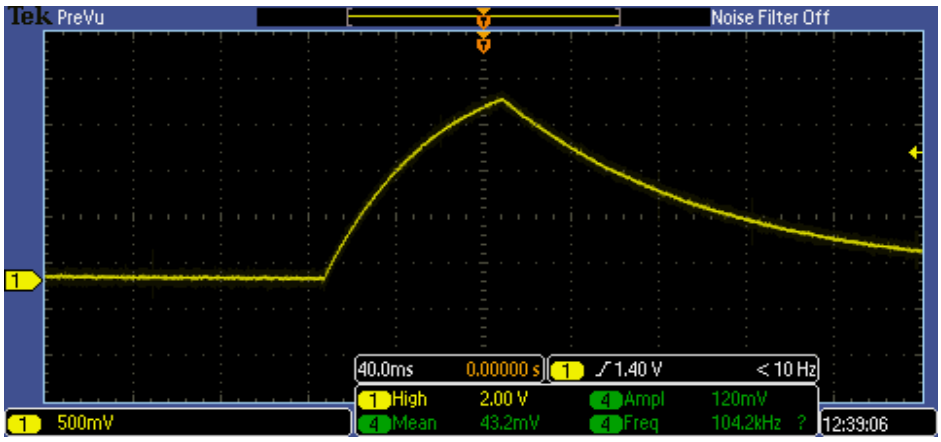

Figure 4. Effect of capacitor on button signal.

As you can see, the capacitor dramatically limits the rate at which voltage can change, especially compared to the size of the bounce noise. Considering the effect the RC filter has, our capacitor is definitely too big for handling button noise alone. This is not surprising. The RC values we chose were specifically meant to reduce bounce noise and any other noise caused by a tap/flick. The circuit was designed this way because it is easier to see the effects of the filter. A smaller capacitor could be used to target the bounce noise specifically.

Source: https://learn.digilentinc.com/Documents/258