Button Bounce

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The purpose of this presentation

To become familiar with small components that are working with microcontroller (Atmega168) such as regulator, capacitor, resistors, switches,….etc

What is a button?

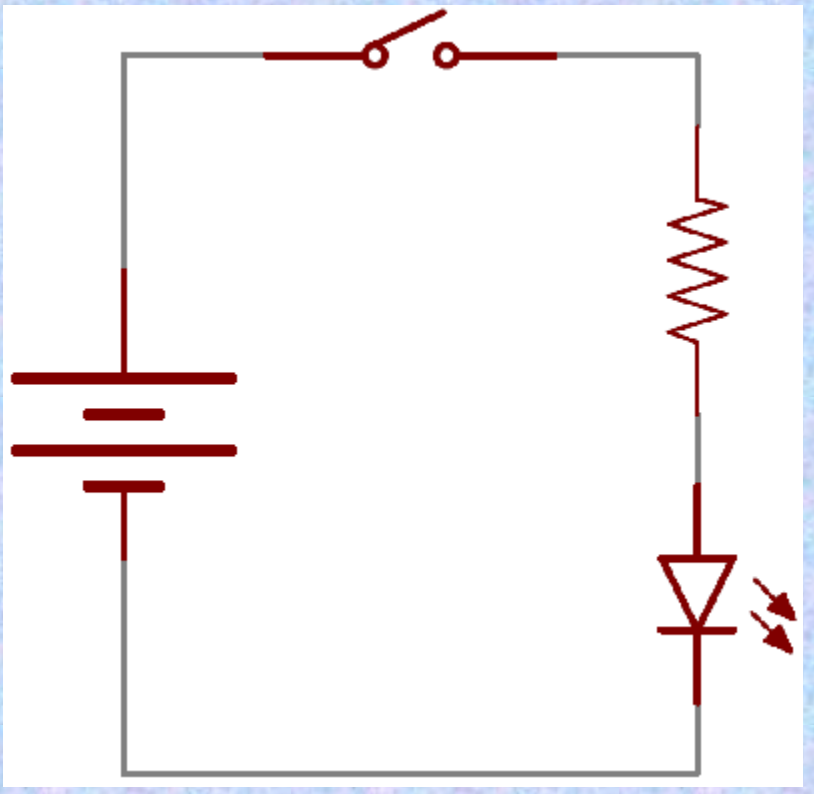
- A switch is a component which controls of an electric circuit. They allow control over current flow in a circuit. Switches are critical components in any circuit which requires user interaction or control.

Button States

A switch can only exist in one of two states: open or closed.

1.In the **off** state, a switch looks like an open gap in the circuit. This, in effect, looks like an **open circuit**, preventing current from flowing.

2. In the **on** state, a switch acts just like a piece of perfectly-conducting wire. A short. This **closes the circuit**, turning the system "on" and allowing current to flow unimpeded through the rest of the system.

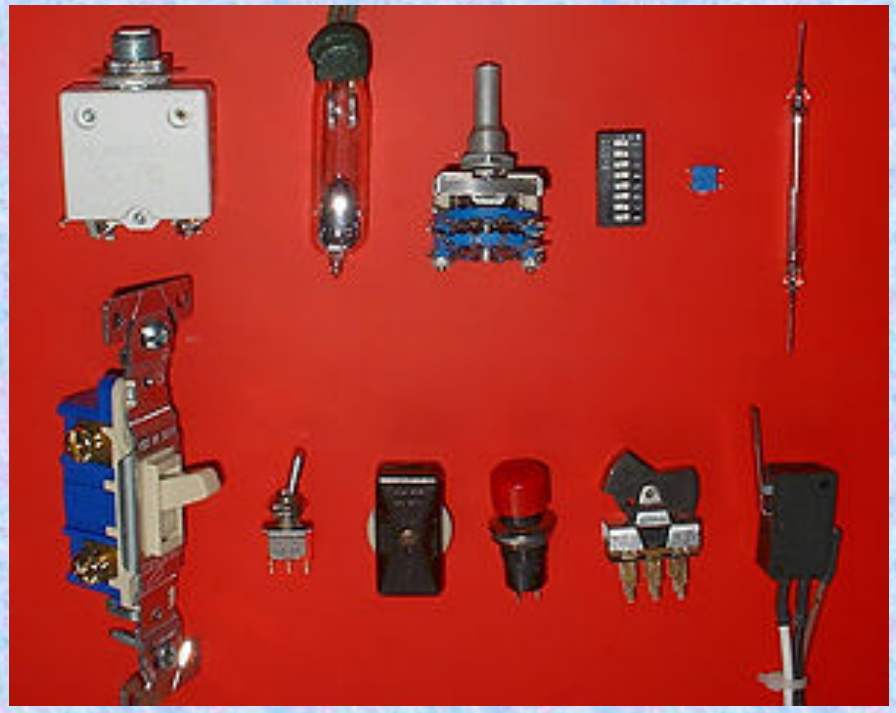


Switch Bounce Definition

Switch Bounce happens when you close a mechanical switch. When you close a switch it tends to literally bounce upon the metal contact which connects the circuit.

Usually switches take a few microseconds to a few milliseconds to completely close. What this means in terms of digital logic is that as the switch physically bounces your logic can switch back and forth low-to-high-to-low-etc... until your switch settles down.

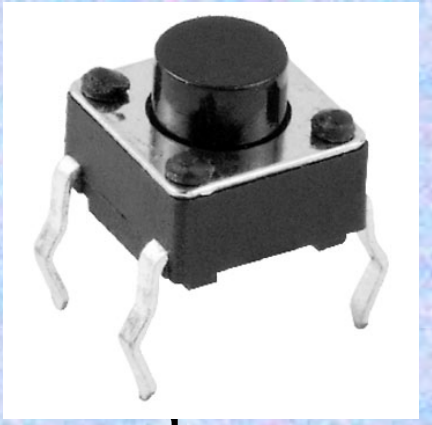
Basic Switches Types



Top: left to right: circuit breaker, mercury switch, wafer switch, DIP switch, surface mount switch, reed switch.

Bottom: left to right: wall switch (U.S. style), miniature toggle switch, in-line switch, push-button switch, rocker switch, microswitch.

Tactile Switch



- It is an on/off electronic switch that is only on when the button is pressed or if there is a definitive change in pressure. A momentary switch is a switch that is activated (or closed) while you're touching it and open when you release the button. By hitting the button you will make an electrical connection between all four pins.

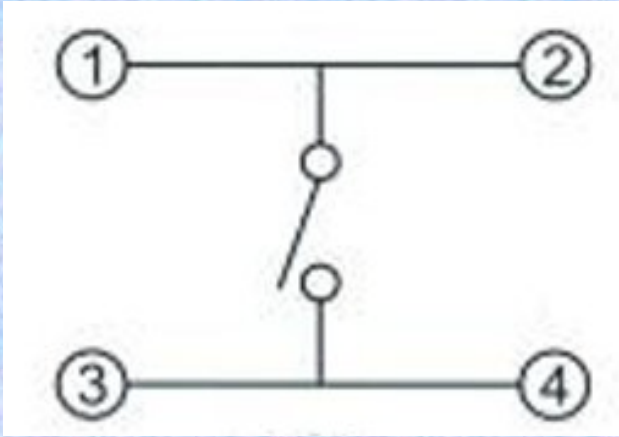


Figure1

Switch Applications

- It is used in keyboards, keypads, instruments or interface control-panel applications.

How does bounce generate?

- When a pushbutton or any switch's position is changed noise is generated. Some noise (contact) occurs **because the switch contact is metal and it has elasticity.** When the switch is moved to a new position it strikes a metal contact and physically bounces a few times. We call this contact bounce.

How does bounce generate?

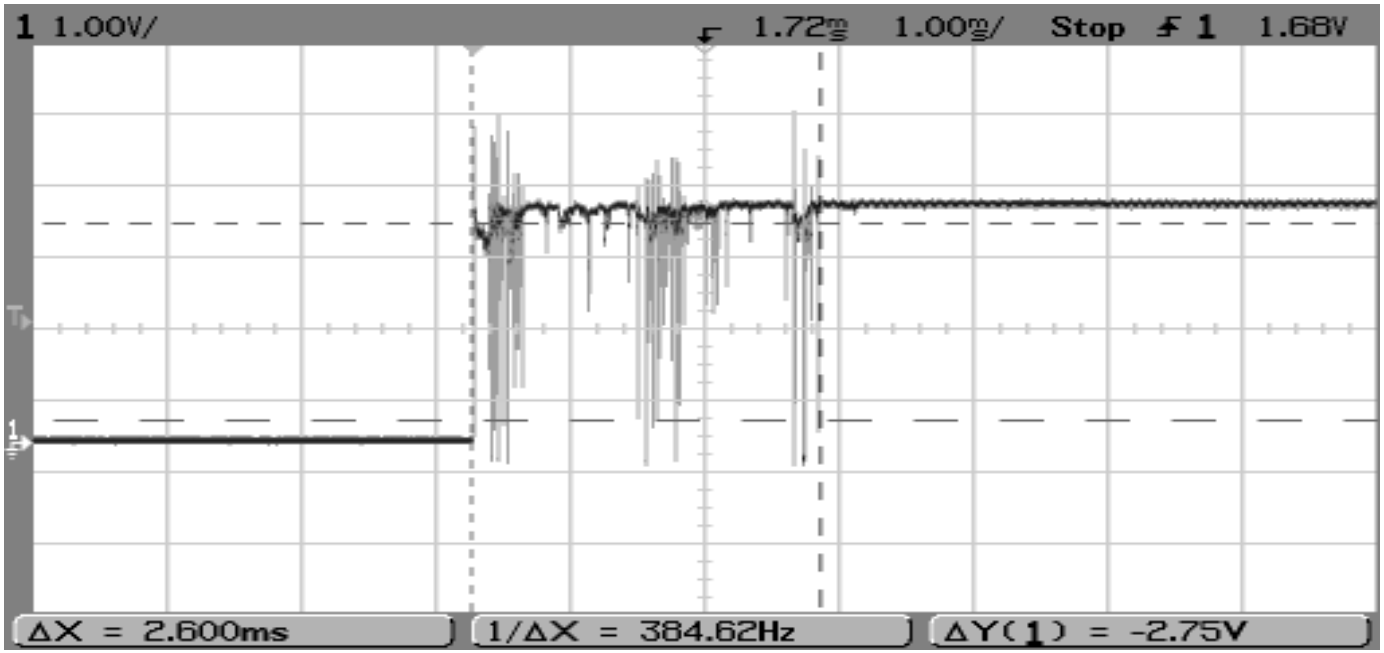


Figure 2 illustrates the electrical signal produced by contact bounce

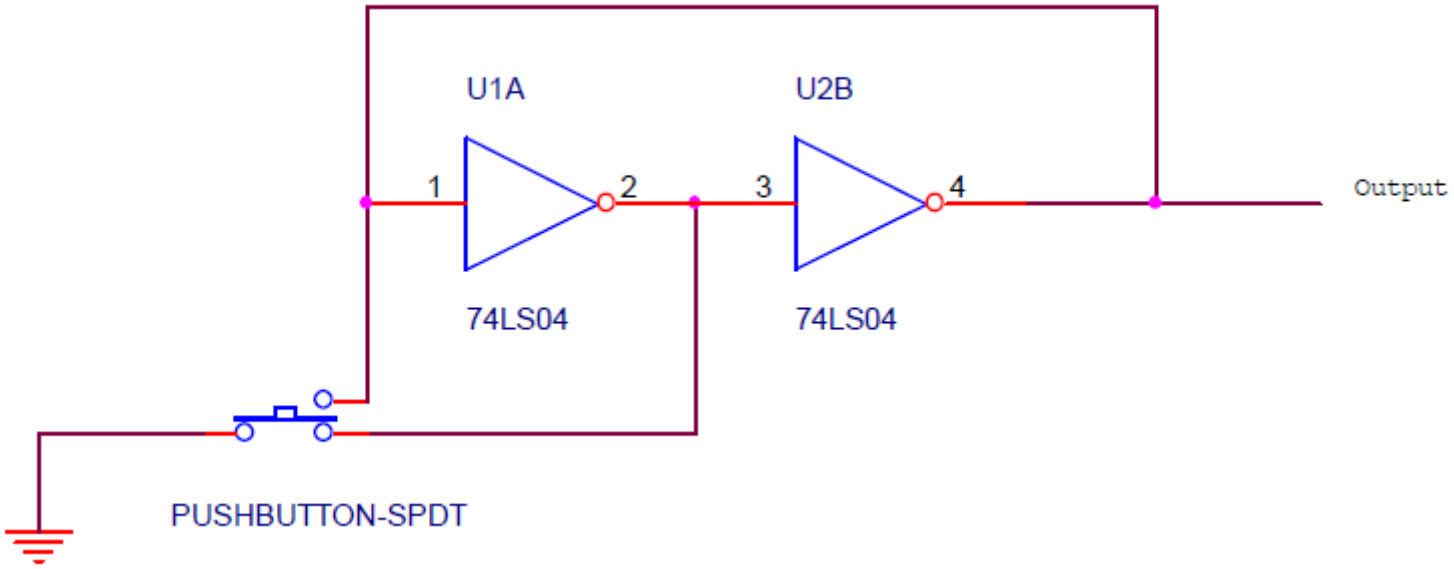
How does bounce eliminate?

- Contact bounce can be eliminated or reduced by using mercury wetted contacts or a solid state device such as a Hall-Effect device. The Hall coefficient is defined as the ratio of the induced electric field to the product of the current density and the applied magnetic field.

Note: Researchers believe that the main cause of the bounce problem is the magnetic field.

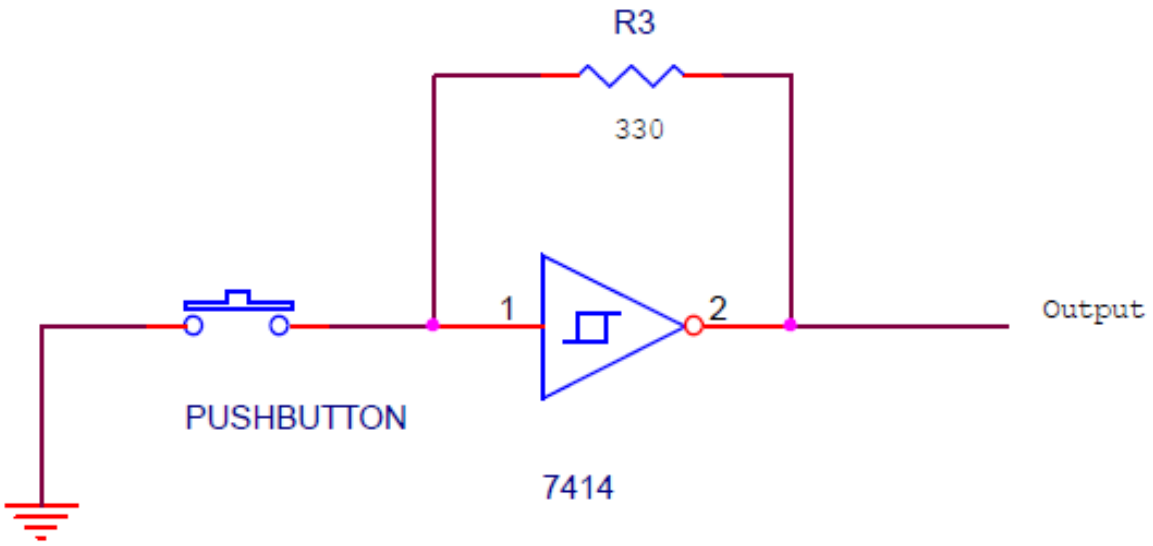
Removing bounces with a circuit

- These noise problems can be easily removed by using a few inverters as illustrated in Figure 3. As you can see, the only problem with this method is that we need a SPDT (Single Pole- Double Throw) pushbutton switch, which costs more than a SPST (Single Pole- Single Throw) pushbutton switch.



Removing bounces with a circuit

- Another method uses a SPST (Single Pole- Single Throw) switch, but still requires a Schmidt Trigger inverter and a resister as illustrated in Figure 4. Both circuits function and remove all noise and bounces, but they cost money.



Conclusion

- All in all, bounce is a one of the problems in the digital switching systems because its affecting on the response of the system by getting it at delay time. The main reference of this problem is the electromagnetic field of the electronics devices.

References

1. https://www.youtube.com/watch?v=5EvWgKw92cs
2. https://www.youtube.com/watch?v=2aBoZHMsL6g
3. http://www.futureelectronics.com/en/switches/tactile-switches.aspx
4. http://en.wikipedia.org/wiki/Switch
5. https://learn.sparkfun.com/tutorials/switch-basics
6. https://www.physicsforums.com/threads/what-is-switch-bounce.489034/
7. http://members.ee.net/brey/Debounce.PDF