CH33-A - Capacitive Touch Hold

Connect a Capacitive Touch Sensor to a Bit Board and control it with code.

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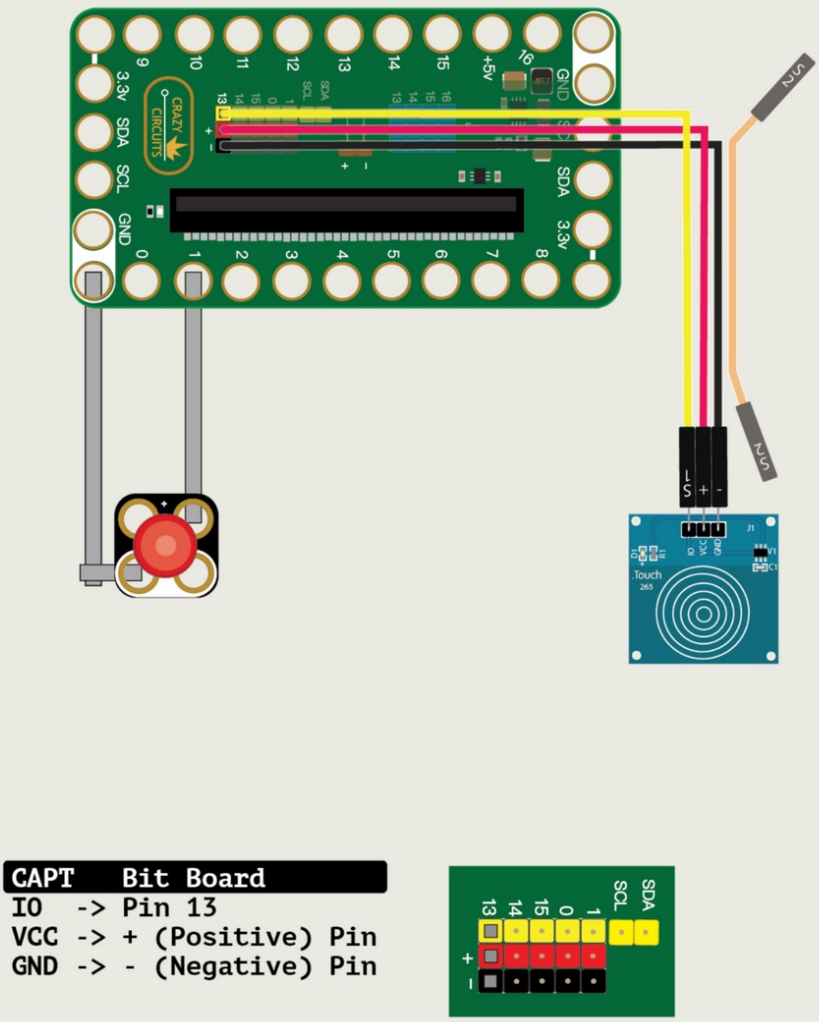


INTRODUCTION

Connect a Capacitive Touch Sensor to a Bit Board and control it with code. A "Cap Touch" sensor is a type of switch, but instead of closing a contact it looks for a change in capacitance, which happens when you place your finger near the sensor.

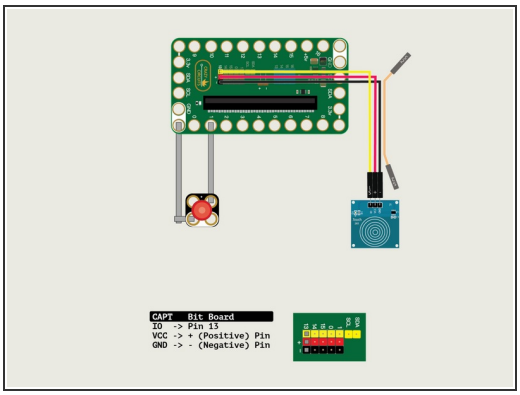
TOOLS:

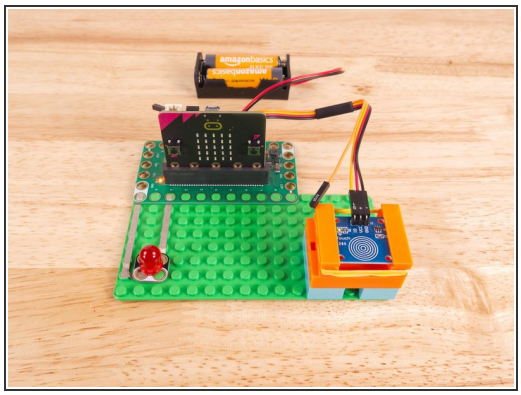
- Computer (1)
- Scissors (1)

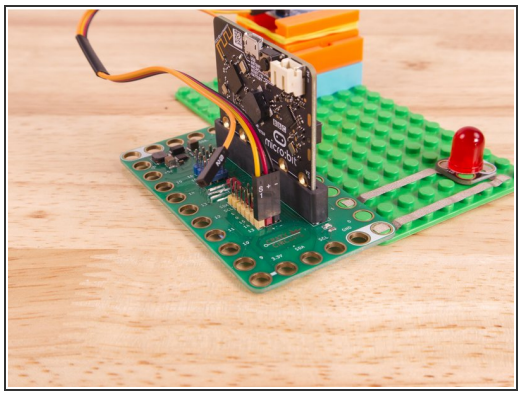
PARTS:

- Crazy Circuits Bit Board (1)
- micro:bit (1)
- Crazy Circuits Ribbon Cable (1)
- Capacitive Touch Sensor (1)

Step 1 — Connect the Capacitive Touch Sensor and LED

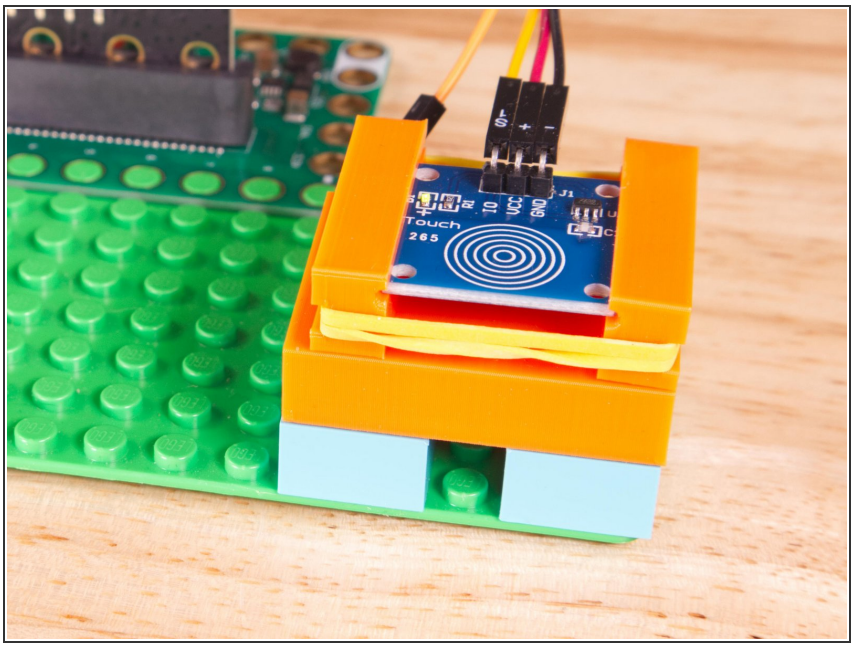






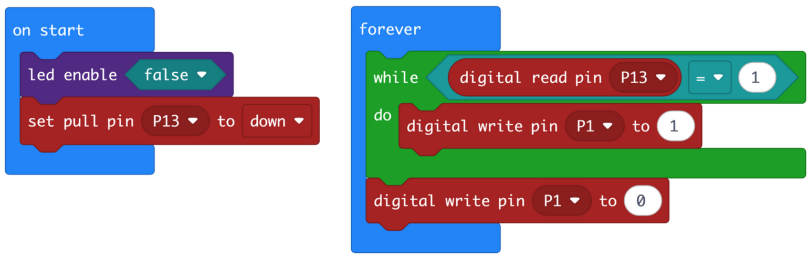
- We'll connect the **Capacitive Touch Sensor** with a **Crazy Circuits Ribbon Cable** using just three of the wires.
- Start by plugging the connector with the three wires in it (Black, Red, Yellow) into the **Pin 13** row of the Bit Board. (Make sure the Black wire is in **-** and the Yellow wire labeled **S1** is closest to the number **13** on the Bit Board.) The Orange wire (labeled **S2**) does not get plugged in and can hang loose.
- Now we'll connect the other end of the Ribbon Cable to the **Capacitive Touch Sensor**. **S1** (Yellow) goes to **IO**, and then **+** (Positive) goes to **VCC** and **-** (Ground or Negative) goes to **GND**.
- We'll use **Maker Tape** to connect the LED to the Bit Board on a LEGO baseplate.
- Connect the **Negative** (-) side of the LED to a **Ground** (GND) hole on the Bit Board and then connect the **Positive** (+) side of the LED to **Pin 1** on the Bit Board.

Step 2 — Mounting the Sensor



- We used a 3D printed holder we designed to hold the Cap Touch Sensor in place on the LEGO baseplate.
- (We don't have a specific holder for the Cap Touch Sensor but the 7 Segment Display Holder should work just fine.)
- Alternately you can use some LEGO bricks and a rubber band or tape to hold the sensor in place. *(But don't use anything conductive!)*
- And be sure to check out the 3D Printed Component Holder Guide if you want to design & print your own at any size.

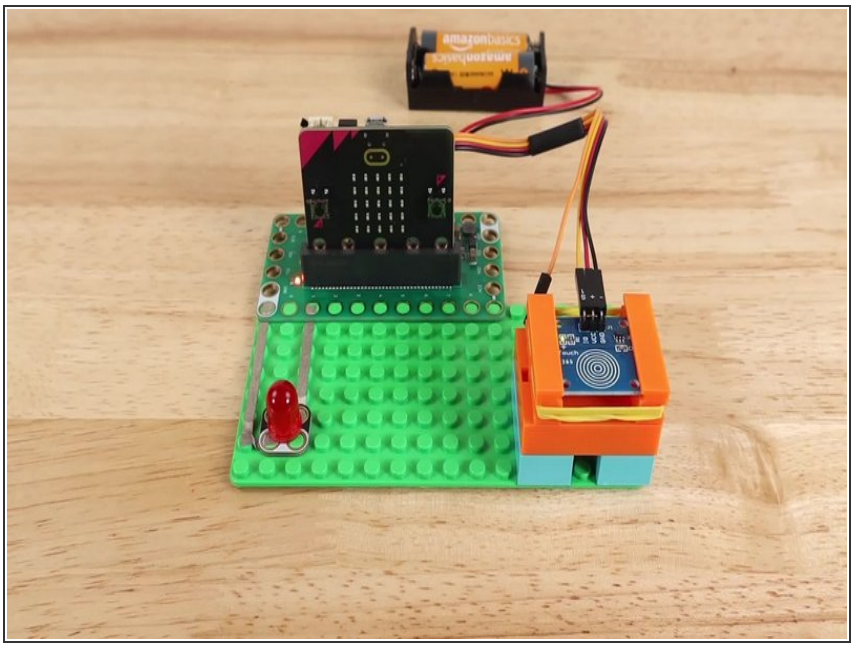
Step 3 — Load the Code



- If you've never used a micro:bit before you'll want to check out this guide: Bit Board V2 Setup and Use
- We're going to load the following code for our **Cap Touch Hold** program: https://makecode.microbit.org/_Yjp7KzRw5...
- In the on start block we'll set **Pin 13** to **down** for the Capacitive Touch Sensor, which is the *opposite* of what we usually do with a standard pushbutton.
- In our forever block we're going to check if **Pin 13** is **1** (or "up" or "high") and if so we'll then turn on the LED connected to **Pin 1** and keep it on as long as **Pin 13** remains "high".

Back when we used a normal button we pulled the pin **high** in the on start and then looked for it to go **0** (or "down" or "low") when pressed.

Step 4 — Test it Out!

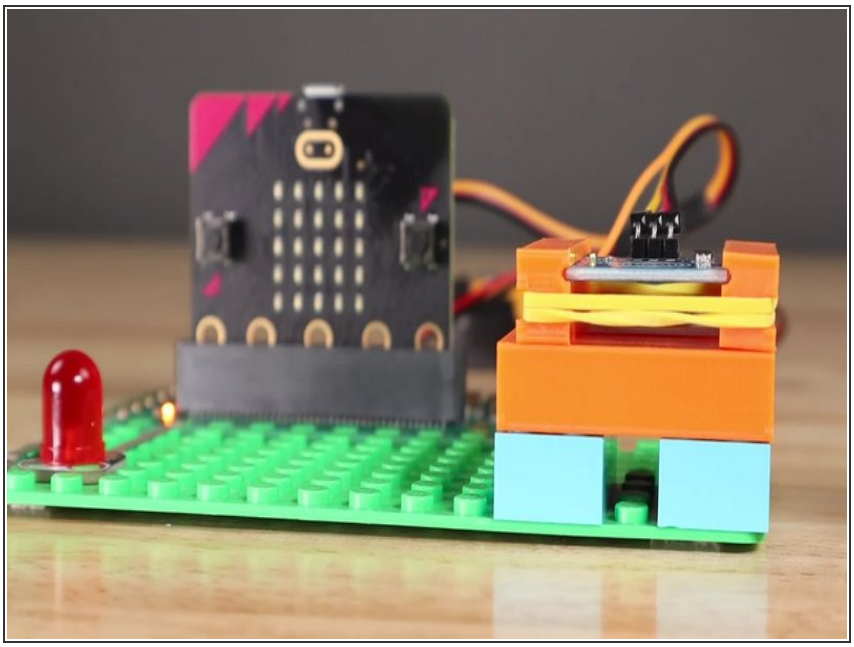


- Once the code is loaded it should start running immediately.

ⓘ You can power the micro:bit via the USB cable you used to load the code or you can use a battery pack plugged into the Bit Board.

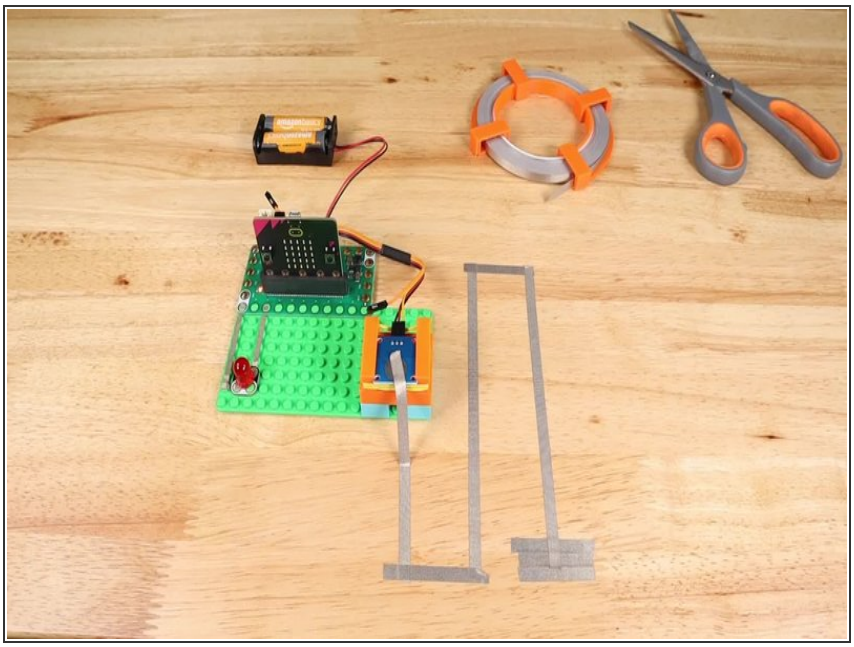
- Touch the sensor with your finger and the LED should light up. Pull your finger away and the LED will turn off. (The LED will only light up when the sensor is being touched.)
- **But wait!** What if we touch the sensor with something we are holding? Try a pencil, a pen (and try metal versus plastic) try some scissors, or other various objects.
- You might also notice the sensor may detect your finger (or an object) if you get really close but don't actually touch it. We'll explore that in the next step.

Step 5 — No Touching!



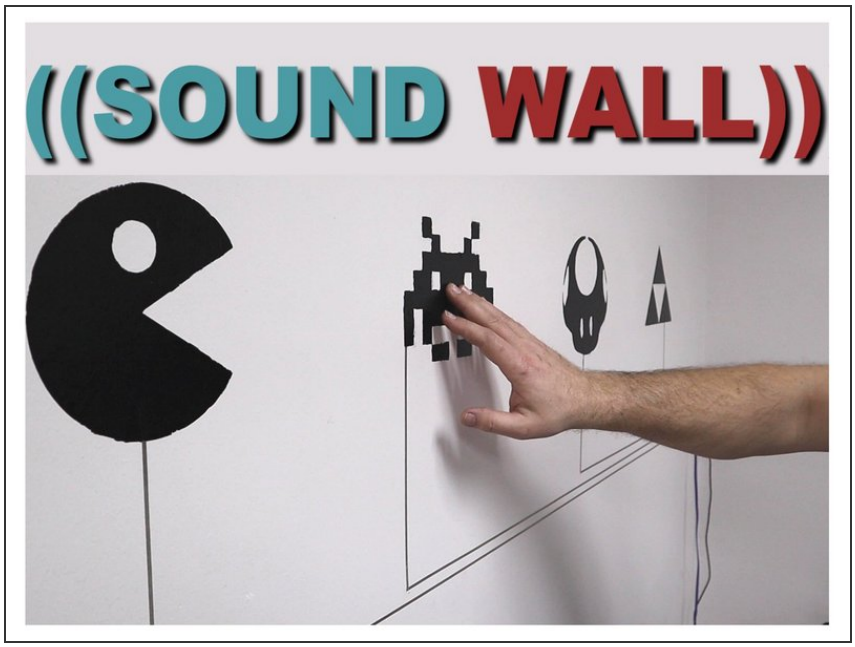
- As mentioned the **Capacitive Touch Sensor** can detect when a finger (or other conductive object being held) touches **or comes close** to the pad of the sensor.
- In this video you can see how the sensor gets triggered by just putting a finger close to (but not touching) it, and that you can even put an object (in this case, a piece of paper) in front of the sensor.
- Here's an excerpt from a post about capacitive sensors:
  - *"The sensor works by measuring changes in an electrical property called **capacitance**. Capacitance describes how two conductive objects with a space between them respond to a voltage difference applied to them. When your finger, a conductive object, touches the device (screen), it changes the capacitance of the sensor."*
  - For a more in-depth study read the full post about capacitive touch sensors.

Step 6 — Long Distance / Antenna



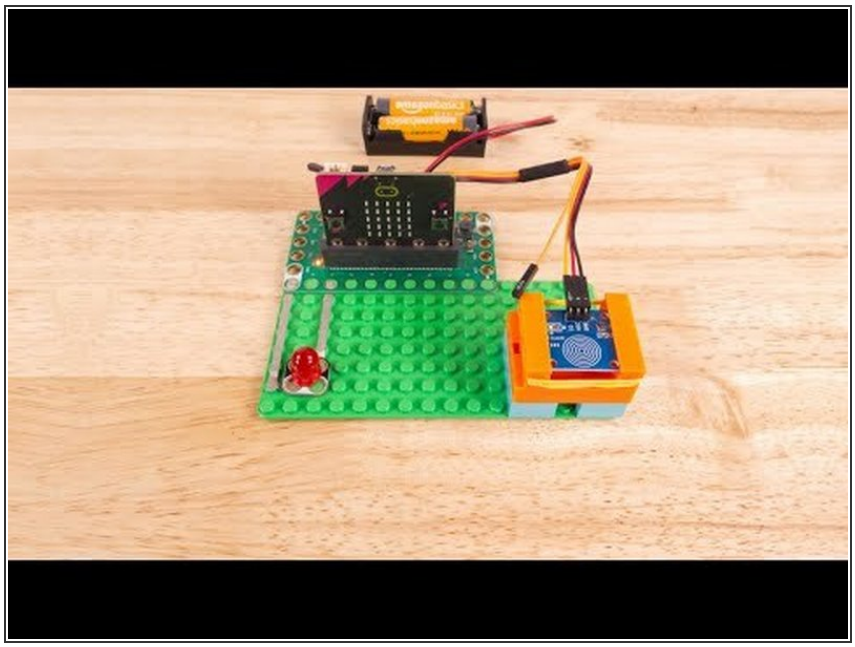
- We've got one more trick with the Capacitive Touch Sensor. If you flip it over you'll see a **silver pad** on the PCB (Printed Circuit Board) and we can use that to extend our reach.
- Connect a piece of **Maker Tape** to the silver pad and run it far from the sensor. You can see in the video we made a little zig-zag pattern, but we've also successfully ran a piece of Maker Tape across a room!
- In the video you'll see that we were able to trigger the sensor by just waving a hand above the Maker Tape. The tape sort of acts like an antenna to amplify the sensors reach.
- One thing worth noting is that **not everyone is the same**! You might be able to trigger the sensor from afar while someone else needs to reach closer.
- Capacitive Touch Sensors can be affected by then environment, and things like humidity, as well as from the differences between people's bodies.

Step 7 — Take it Further



- Our Sound Wall project (from 2020) used a different microcontroller but could be built using a micro:bit along with a few of the Capacitive Touch Sensors and an MP3 Player.
- We have a guide on using the MP3 Player with the micro:bit so it would mainly be a matter of replacing the buttons with Cap Touch sensors.
- By connecting Maker Tape to the back side of the Cap Touch Sensor we can build touch points far from the micro:bit and build bigger projects with unique touch trigger capabilities.

Step 8 — Follow Along



- Follow along with our recorded Live Stream!

ⓘ You can watch the full video of us walking through this project, along with explaining and exploring the code: https://www.youtube.com/live/tgQ9Y5K9t2I

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