

LED Fun

Goal

Learn to connect an LED light or two or three to the micro:bit and control those LEDs with MakeCode programs.

Understanding the hardware

LEDs (light-emitting diodes) are small lights that use very little electricity. Power only flows through an LED in one direction. If the power is flowing in the right direction, you get light. Otherwise, you need to reverse your circuit, typically by swapping which wire goes from the power source to each leg of the LED.

The long leg of an LED is usually the positive one and the shorter is the negative or ground. We will use the micro:bit to power the LED instead of connecting it to a battery. This will allow you to control the LED or LEDs with MakeCode programs you write.

Caution! Do not let the legs of an LED touch each other or allow anything attached to the LED legs to touch each other. This will cause a short circuit and your LED will not work properly.

The micro:bit has five holes along its bottom. They are called pins (even though they look like holes).

Three of those pins, P0, P1, and P2 can be used to send electricity out of the micro:bit to turn something on, like an LED, buzzer, or motor. They also work as inputs, like a button or switch, but we will only use them as outputs for now.

To complete an electrical circuit and turn an LED on or off, the positive leg of the LED needs to be connected to one of the output ports (P0, P1, P2) and the negative leg is always connected to GND (which stands for ground).

We will connect LEDs to the micro:bit with alligator clips. Clip one alligator clip to the positive leg of the LED and another to its negative leg. Remember not to cross the wires. The colors of the alligator clips do not matter.

Test your LED by connecting the positive (longer) leg of the LED to an alligator clip and attach that alligator clip to the pin that says 3V. That's the 3 volt pin. It's like a battery. It is always on if the micro:bit is on and outputs 3 volts of electricity. It is good for testing your circuit, but you can not turn it on and off with a computer program.

Next, connect an alligator to the short leg of the LED and the other end of that alligator clip to GND.

Did your LED light up?

If not, switch the connections.

Programming the micro:bit to control an LED

Once you can light an LED, take the positive alligator clip off 3V and connect it to pin P0.

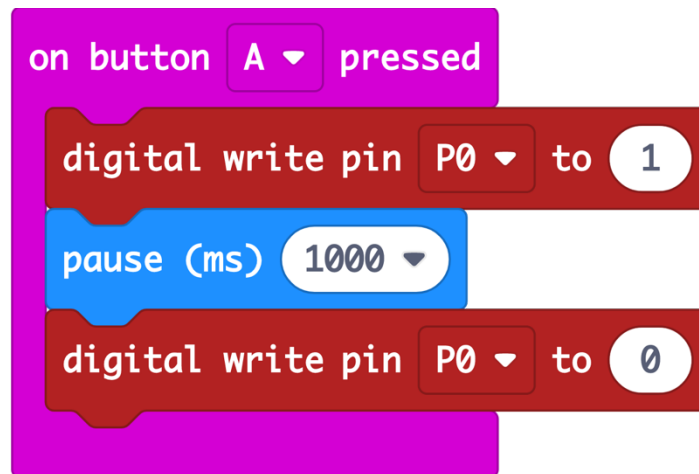
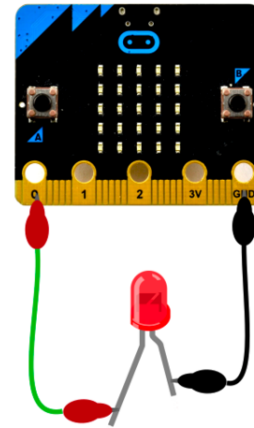
Now, let's write a new program.

- Go to makecode.com
- Start a new MakeCode project and name it *LED*.

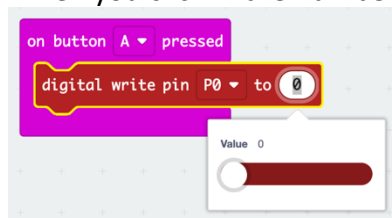
We will need to use some new blocks and they are hiding under the **Advanced** section of the MakeCode toolbox. (Ooooooh advanced!)

We will use a couple of blocks from the **Advanced-Pins** blocks.

- Create this program in MakeCode



When you click in the number field of digital write pin, you see that it gives you a choice of 0 or 1.



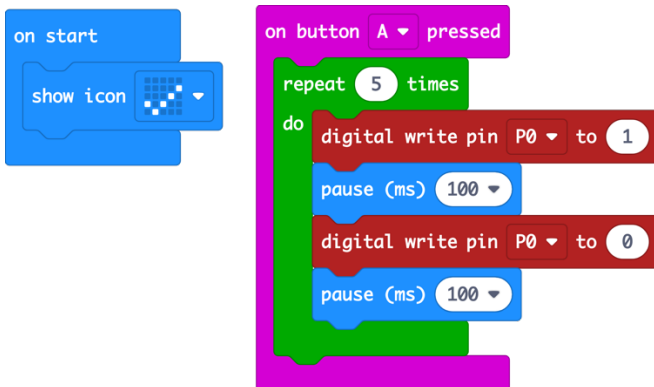
0 is often referred to as *low* or *off*
1 is often referred to as *high* or *on*

You can choose P0, P1, or P2 from the popup menu in the block

- Read the program. Can you predict what it will do?
- Download the program to your micro:bit
- Click the A button and see what happens
 - Did the light go on and off?
- Fix any bugs and download a new version if necessary

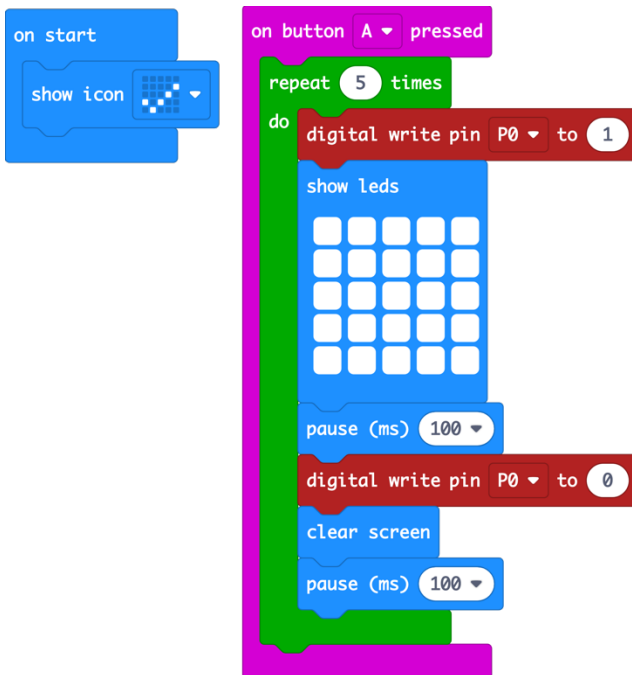
Blink the LED

Change the program to the following, download, and test it.



It is good programming practice to pause for the same amount of time when you repeat a pattern. If you turn on and wait a little, turn off and then wait a little. Change the length of the pause to speed up or slow down your blinking light.

What does this version of the program do differently from the version you just programmed? Try it and find out!



Challenge

Program the micro:bit to turn on the LED when you press the A button and off when you press B.

Challenge: Connect two LEDs!

Are you ready for this challenge?

- Connect a second LED to P1 and GND
 - Leave the first LED connected to P0 and GND
- Write a MakeCode program to turn the first LED on when the A button is pressed and the second LED on when you press the B button
- When the user shakes the micro:bit, turn off both LEDs
- When the user presses A+B turn both LEDs on

Tricky Challenge

Write a MakeCode program that turns on one LED when you press A and does the opposite when you press B. In other words, you are switching between the two lights.

Super Tricky Challenge

With a buddy, write a program (using radio) to turn on or off one or more LEDs connected to your friend's micro:bit.

Super Dooper Tricky Challenge

Send a random number to a friend's micro:bit to make their micro:bit flash the number of times your micro:bit sent. Think hard about this one. You know how to do it!

Super Dooper Extra Collosal Tricky Challenge

Do the "Connect Two LEDs" challenge above over radio to a toggle between the LEDs connected to a friend's micro:bit.

Go Nuts!

Invite others to your radio group and turn each other's lights on and off. Try connecting three LEDs to your micro:bits!

Remember to save your really cool programs!