

# Codebug Flashing LEDs

## TechResort Mini Makers Session #1103

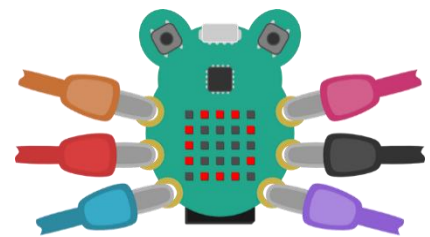


### What do I need?

- A laptop with internet access
- A Codebug microcontroller
- A USB cable
- Two 3-volt LEDs
- Wires with crocodile clips
- *A 3-volt coin cell battery (optional)*

### What is a Codebug?

A Codebug is a simple type of electronics board called a microcontroller. The Codebug can be used for simple electronics tasks.



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## How are we going to be using the Codebug?

In this session you will use your previous knowledge of programming the Codebug, and use it to control little lights called Light Emitting Diodes (LEDs).

By the end of the session you will have learned how to wire up and control the LEDs using the Codebug!

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**If you get stuck, does someone around you have the answer?  
If they don't, then please ask an Elf.**

**Once you have finished reading this page, please turn over to learn more!**

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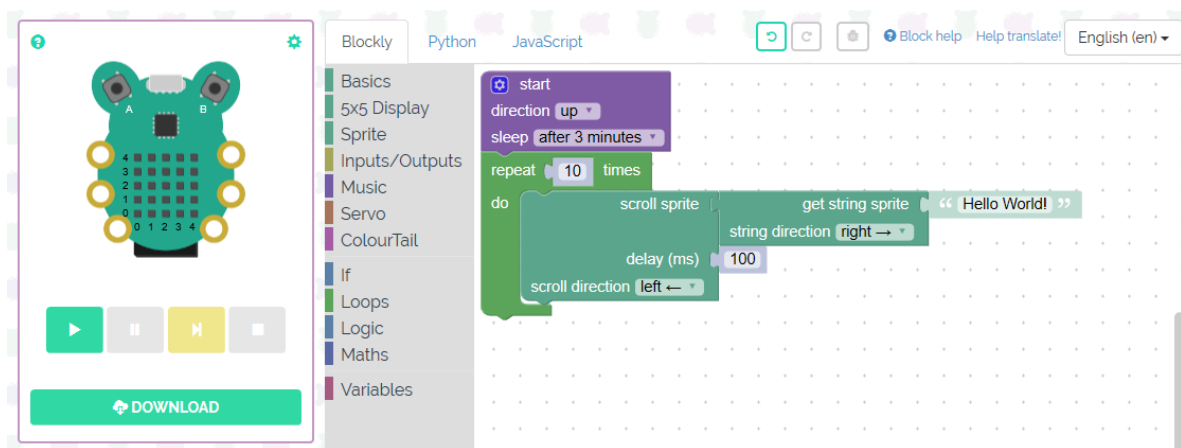
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# Codebug Basics

Before we start setting up the electronics, we'll run through a quick refresher on using the Codebug.

## Programming Reminder



- Set up this simple code to remind you how to use the Blockly coding language. You use it very much like Scratch, it just looks a little different.

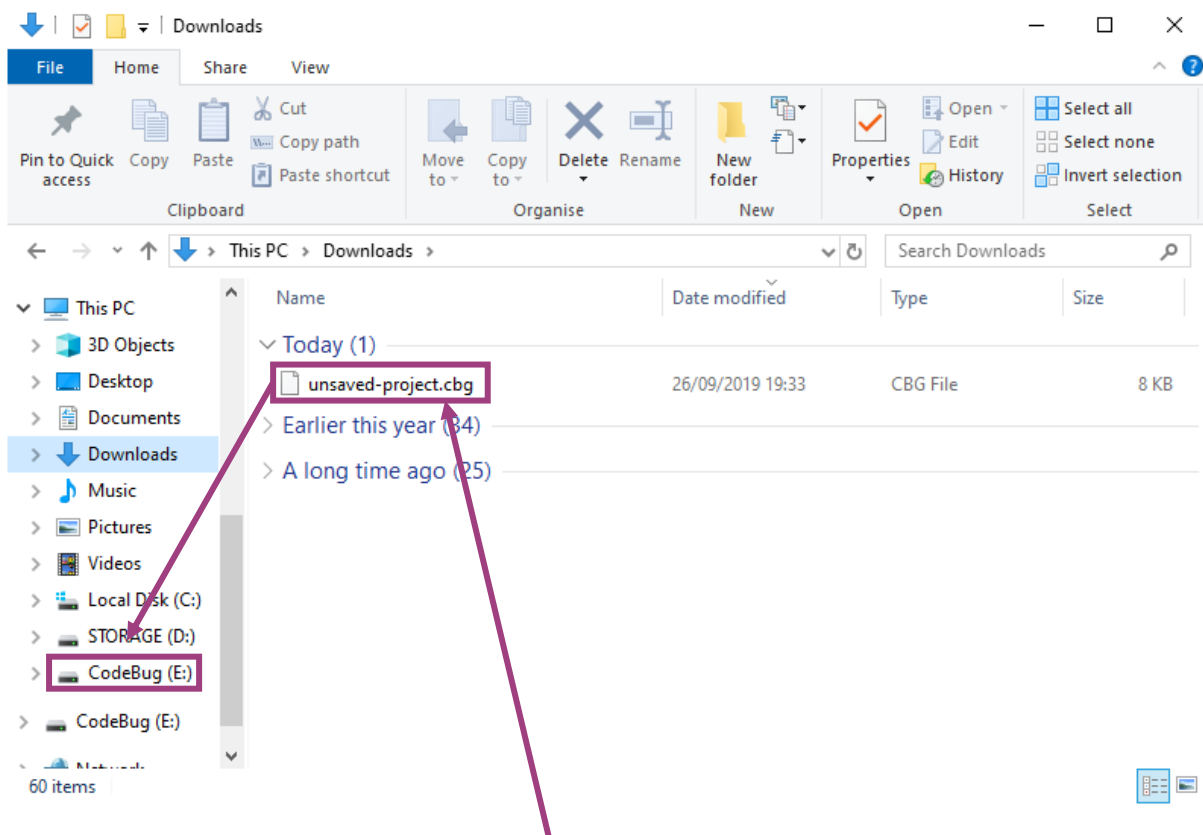


- To test your code, click on the 'play' button  underneath the Codebug on your screen.
- When you're happy your code is working, then you can download it to the Codebug.

## Download Reminder

- Make sure there is no battery in the Codebug.
- Plug one end of the USB cable into the Codebug.
- **Before you plug the Codebug into your PC** – press and hold button A, then plug the other end of the USB cable into your PC **whilst still holding button A**.
- Once you've plugged it in, a light should come on. When the light starts flashing, it is telling you that the Codebug is ready to receive a program.

- Click on the green “Download” button  on the Codebug webpage. After a short delay a box with the title “One moment...” will pop up.
- Press “Close” on the box, and the file will either begin downloading, or you will be asked whether you want to open or save the file. We want to **save**.
- Open the File Manager program  and select “Downloads”. You should see something like this:

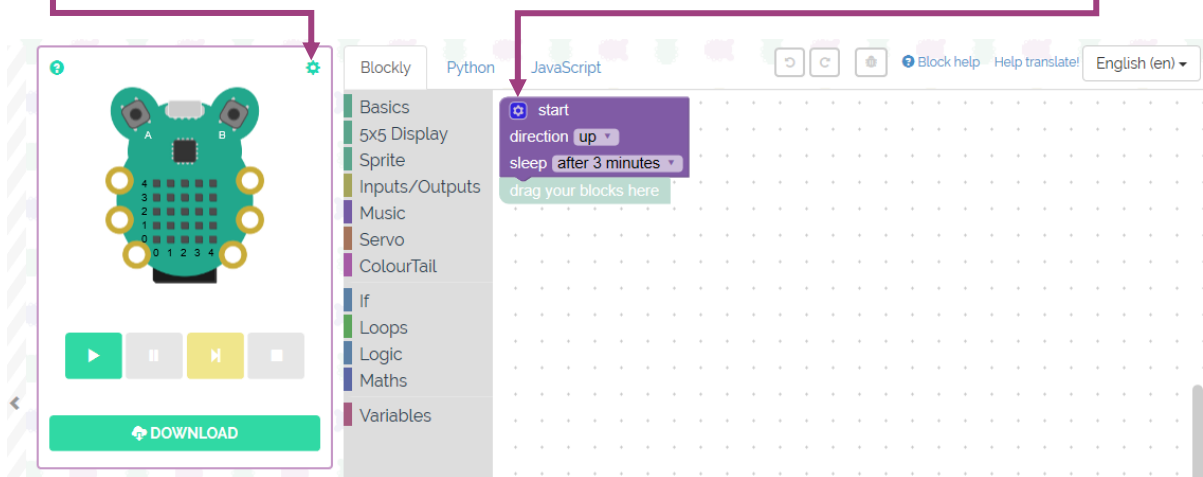


- Drag and drop the Codebug file onto the Codebug on the left. Another light should appear to tell you that it has received the program.
- Press B on your Codebug to run the program.
- If it’s all working well, your Codebug should be scrolling the words “Hello World”!
- Now we can begin working on electronics with the Codebug...


# Setting Up the Codebug for Electronics

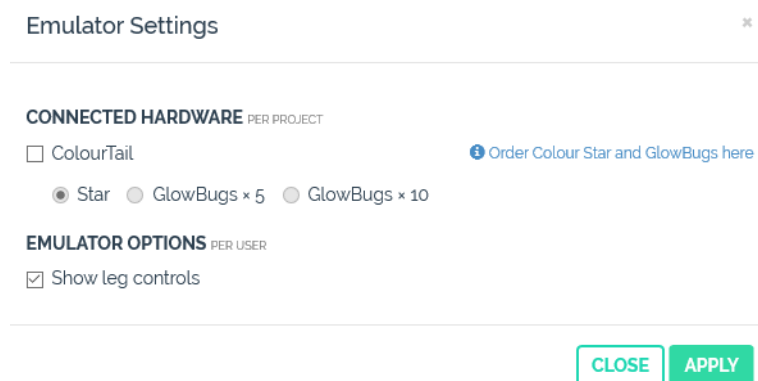
Before we attach any components to the Codebug, we need to set it up to work with the components.

- Start a new project by pressing the “Create” button at the top of the page.
  - *This may ask you if you want to leave the page as you already have some code on the page. If it does then click **leave**, as we were just making a test program.*
- The little cogwheel symbols in the corner of the window with the Codebug in (this is called the **emulator**), and the corner of the “start” block will open configuration menus:



First, we’ll set up the emulator.

- Click on the green cog wheel  and the following window will appear:

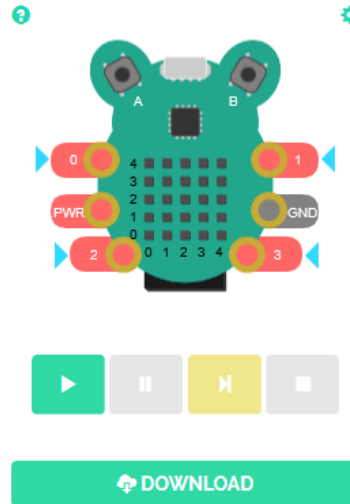


- Now check the box that says “Show leg controls”, then click “Apply”.

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- Your emulator window should now look like this:
- Notice how the connectors on the Codebug (the gold rings) have been labelled with their names:

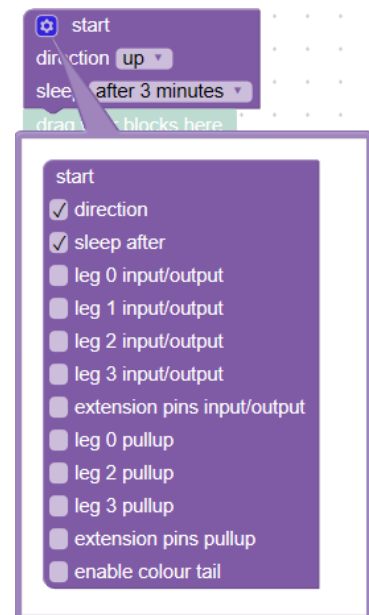


Next, we'll set up the "start" block:

- Click the cogwheel on the "start" block:

You can see various options that you can add to the start block. This time we'll add the "leg 1 input/output" option.

- Tick the checkbox next to "leg 1 input/output".
- Click on the cogwheel again to close the options menu.

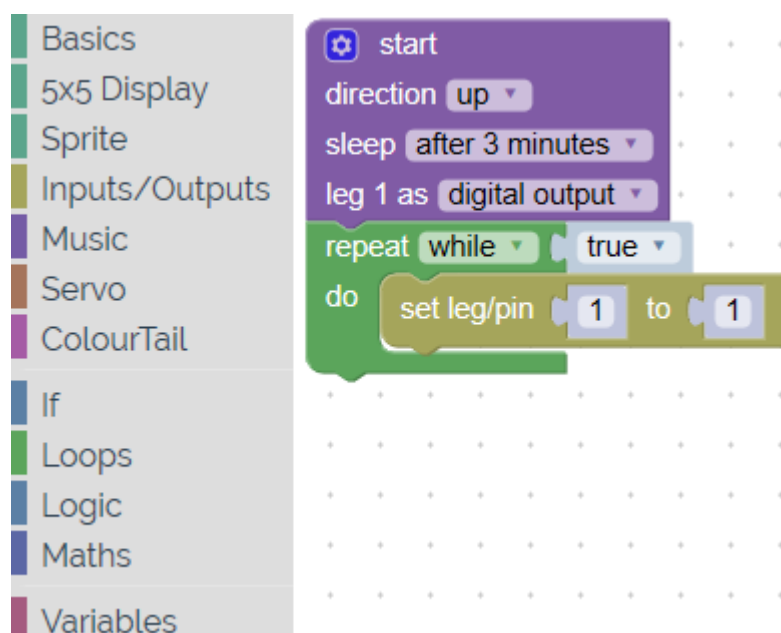


Now change the following settings to the “start” block:

- “Sleep” to “after 10 minutes” – this will stop the Codebug turning off too soon.
- Ensure “leg 1 as” is set to “digital output” – this will allow you to program leg 1 to control electronic components.

## Lighting an LED

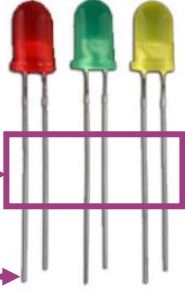

Now we need some simple code to turn leg 1 on:



- By setting the leg/pin to ‘1’, we’re turning on the LED.
- Placing the “set leg/pin” code in the “repeat while true” loop means that your program will run forever.
  - This is important, as without this code, the Codebug would turn on the LED, then end the program, which would turn the LED off. This would happen so quickly, you wouldn’t see the LED light up!

## Connecting the Codebug to an LED

We now need to connect the Codebug to the LED so that your program can light it up!

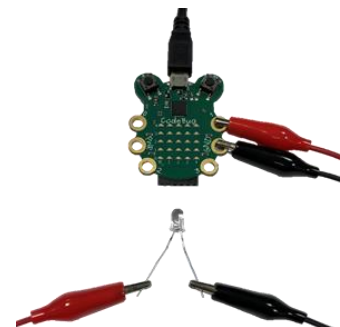
- Like batteries, LEDs have negative and positive terminals.
  - The terminals are the two legs poking out of the bottom of the LED. 
- The longer of the two legs is the positive terminal. 
- When you've identified the positive terminal, bend the legs apart slightly to make connecting easier.

- This will also help you avoid accidentally connecting the two legs together. Once powered, this would cause a **short circuit** which could damage the LED and stop it working.



- You have wires with crocodile clips. These work like clothes pegs to fasten wires to terminals.
- When connecting your wires up, be careful to make sure the red and black wires don't touch. This would cause a short circuit.
- We use red wires to connect positive terminals, so connect the positive terminal of your LED to leg 1 of your Codebug (the metal ring with a '1' next to it).
- Now connect the negative terminal of your LED to the ground leg of the Codebug (the metal ring with 'GND' next to it) using the black wire.
  - The ground leg is the negative terminal of the Codebug.

- Your circuit should look something like this:

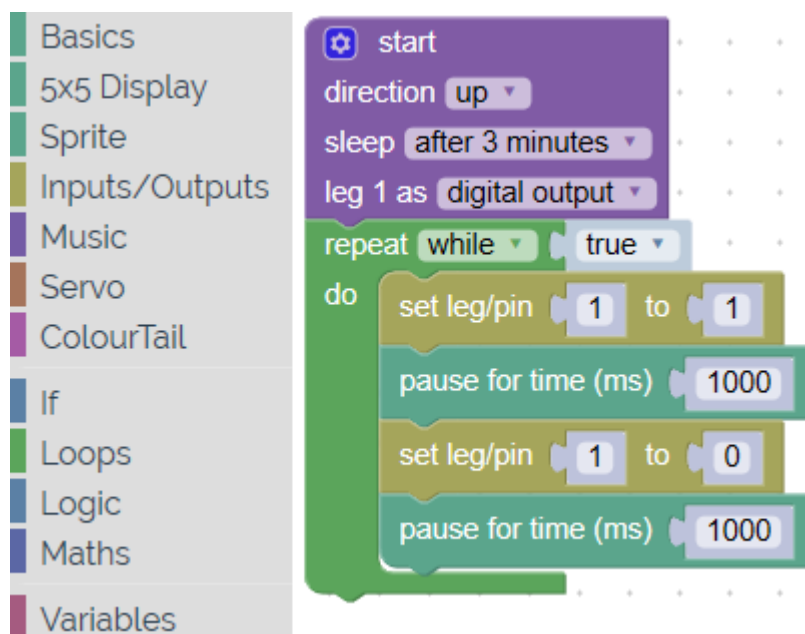


## Downloading the LED Code to the Codebug

- Carefully connect the Codebug to your computer (remember to hold down the A button).
- Download your program.
- Copy your program to the Codebug.
- Press the B button to run the program.
- Your LED should light up.

## Blinking an LED

- Carefully disconnect your Codebug from the PC, but keep the LED connected.
- Now amend your program to “*pause*” for 1000ms after turning the LED on.
  - There are a thousand milliseconds (ms) in a whole second.
  - If you’re having trouble finding it, try using the colour of the blocks below to help!





- After the “*pause*” command, add a command to turn the light off.
- Then add another “*pause*” command.
- Make sure all these commands are within your “*repeat while true*” loop.
- Connect your Codebug, download your program, and see what happens!

## Experimenting

Now have a go at these things, and see if you can do them:

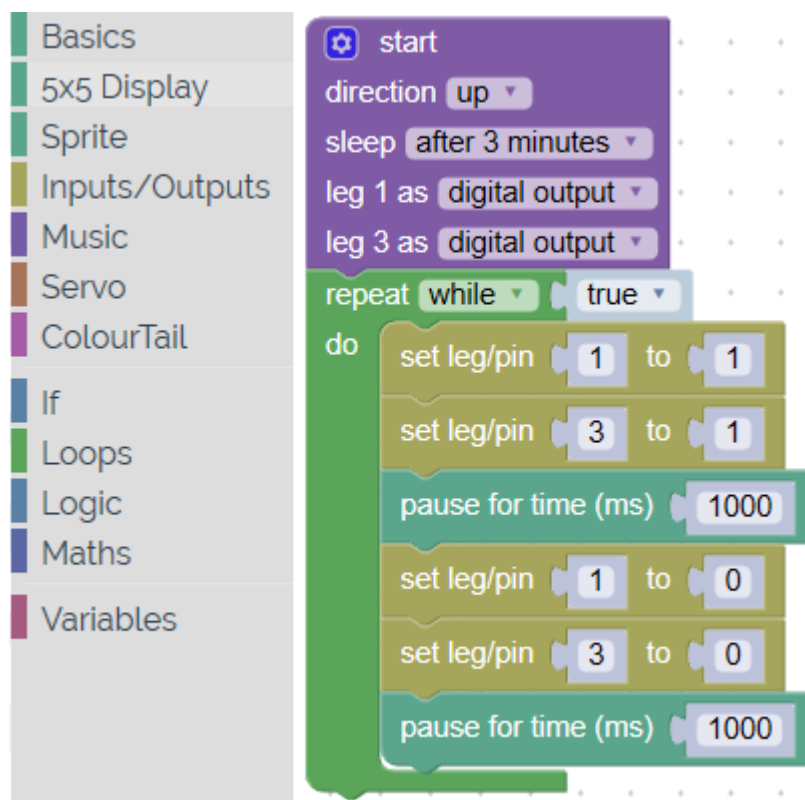
- Make the LED blink faster.
- Make the LED blink unevenly – staying on for longer than it stays off.

## Two LEDs

You can use any other numbered leg to drive a second LED just like the first one!

- Connect them with crocodile clips as before – you’ll have two clips attached to the ground leg.
- Now can you amend your code to blink both LEDs?
  - Remember to modify the “*start*” block for the other leg that you use!
- Don’t turn the page until you’ve given this a go...

Here's one possible piece of code for two LEDs:



The image shows a Scratch-style code editor with a sidebar on the left containing categories: Basics, 5x5 Display, Sprite, Inputs/Outputs, Music, Servo, ColourTail, If, Loops, Logic, Maths, and Variables. The main workspace contains the following code blocks:

- start
- direction up
- sleep after 3 minutes
- leg 1 as digital output
- leg 3 as digital output
- repeat while true
- do
  - set leg/pin 1 to 1
  - set leg/pin 3 to 1
  - pause for time (ms) 1000
  - set leg/pin 1 to 0
  - set leg/pin 3 to 0
  - pause for time (ms) 1000

## Using the Buttons as Inputs

Buttons A & B can be used to control the Codebug program.

- What would happen if instead of a “repeat while true” loop, you used a “repeat until button A pressed” loop?

## Challenges

Now you're a genius Codebug programmer, can you show us how to do these things:

- Make a sprite on the Codebug display flash whilst the LED is flashing?
- Write a number on the Codebug display which shows which number leg is on?
- Turn the LEDs on if Button A & B are pressed at the same time?
  - If you're stuck, try looking in the “Logic” blocks.