TEXT DISPLAY

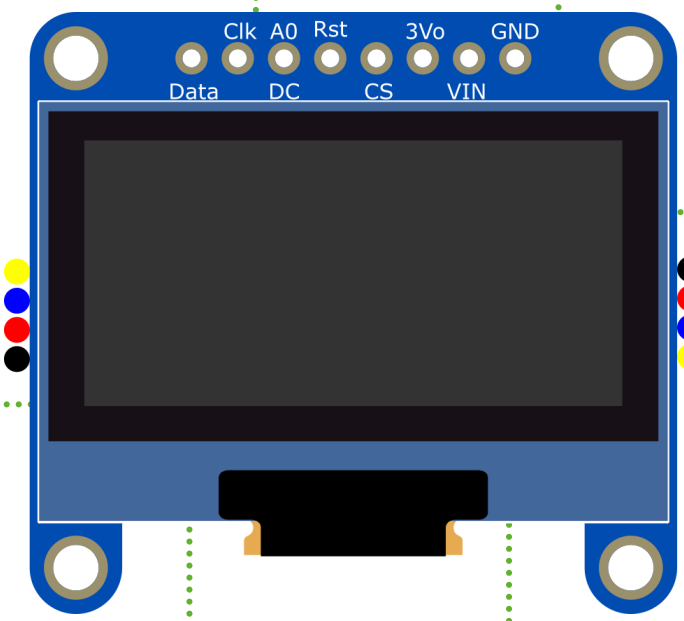
WITH AN OLED SCREEN

#R1AS10

What is it?

A screen helping you to display some pieces of information hidden inside your electronic components.

Available on



Duration

30 minutes

Pre-requisites

- R1AS03 - Buttons and LED Display

Level of difficulty

Advanced

Material

- 1 Programming board "***STM32 IoT Node Board***"
- Micro-B USB Cable
- 1 OLED Display Monochrome 1.3" 128x64 OLED from Adafruit
- 1 QT Cable to connect the display to the board

LEARNING OBJECTIVES

- Connect an LCD Screen to your board
- Display text on your LCD screen
- Place text on a screen
- Display the current state of your program

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Programming an electronic board is sometimes a very confusing activity. A microcontroller is a black box where we cannot see how it works and what happens inside. To light up your code, you can use a screen that helps you to display some pieces of information hidden inside your electronic components. This activity sheet explores how to use **SSD1306-based monochrome OLED displays** with MakeCode.
Resource: https://www.electronicwings.com/sensors-modules/ssd1306-oled-display

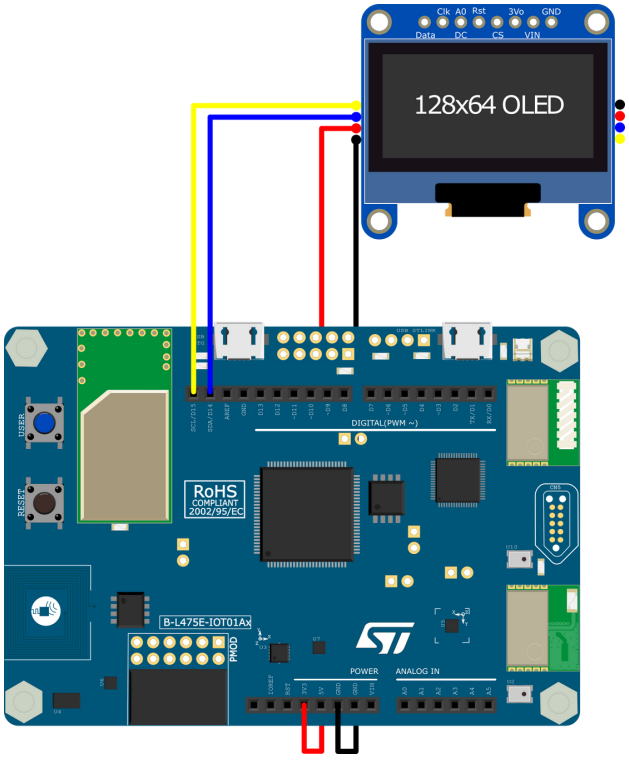
STEP 1 - MAKE IT

1 Connect the board to the display

There are two ways to wire the SSD1306 OLED to a board, either with an **I2C** or **SPI** connection. For our screen, we use the **I2C connection** through the **QWIIC/STEMMA** cable with the following convention :

- Black for **GND**
- Red for **V+** (**3V3**)
- Blue for **SDA** (**D14**)
- Yellow for **SCL** (**D15**)

Resources: https://en.wikipedia.org/wiki/I2C, https://en.wikipedia.org/wiki/Serial_Peripheral_Interface, https://www.sparkfun.com/qwiic, https://learn.adafruit.com/introducing-adafruit-stemma-qt/what-is-stemma-qt



Connect the board to the display

2 Connect the board to your computer

With your USB Cable, connect the board to your computer by using the **USB ST-LINK connector** (on the right corner of the board). If everything is going well you should see a new drive on your computer called **DIS_L4IOT**. This drive is used to program the board just by copying a binary file.

3 Open MakeCode

Go to the **Let's STEAM MakeCode editor**. On the home page, create a new project by clicking on the "New Project" button. Give a name to your project more expressive than "Untitled" and launch your editor.
Resource: makecode.lets-steam.eu

4 Install Extension

After creating your new project, you will get the default "ready to go" screen shown here.

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STEP 1 - MAKE IT

What is an Extension? Extensions in MakeCode are groups of code blocks that are not directly included in the basic code blocks found in MakeCode. Extensions, like the name implies, add blocks for specific functionalities. There are extensions for a wide array of very useful features, adding gamepad, keyboard, mouse, servo and robotics capabilities and much more.

See the black **ADVANCED** button at the bottom of the column of different block groups. When you click on it, you'll find out additional block groups. At the bottom, there is a grey box named **EXTENSIONS**. Click on that button.

Choose the extension "**SSD1306 Display**".

Program your board

5

Inside the MakeCode Javascript Editor, copy/paste the code available in the **Code It Section** below. If not already done, think of giving a name to your project and click on the "**Download**" button. Copy the binary file on the drive **DIS_L4IOT**, wait until the board finishes blinking and your program display some text!

Run, modify, play

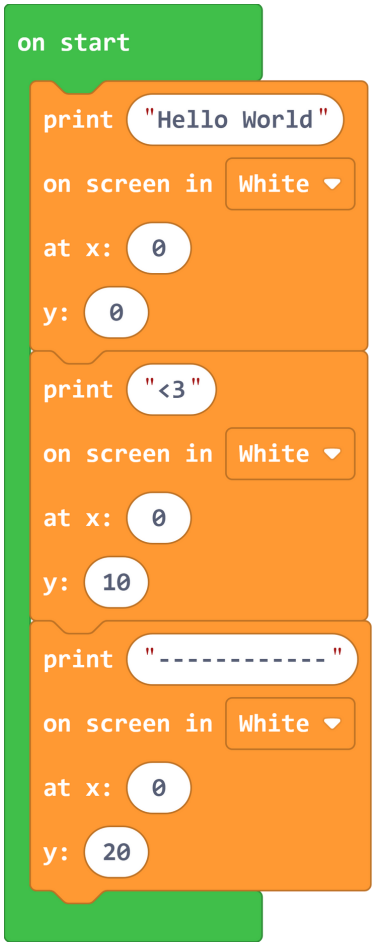
6

Your program will automatically run each time you save it or reset your board (push the button labelled RESET).

If everything is fine, your board will give you some friendly salutations. Try to understand the example and start to modify it by changing the text, adding as many symbols as you can or just fill the screen slowly one letter by second.

Feel free to try to display any piece of information on your program to see the current state of your board.

Advanced menu with extensions



Full blocks enabling the program to run

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STEP 2 - CODE IT

```
oled.printString("Hello World", PixelColor.White, 0, 0)
oled.printString("<3", PixelColor.White, 0, 10)
oled.printString("------------", PixelColor.White, 0, 20)
```

How does it work?

You can write a line of text with the printString() function. This function takes the following parameters:

- String of text
- Text color (PixelColor.Black or PixelColor.White)
- Text X position
- Text Y position

On the SSD1306 screen, the origin (the position x=0 and Y=0) is on the top left corner.

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STEP 3 - IMPROVE IT

1. Try to **center the heart** of the second line by modifying the X position of the text.

2. By **adding a loop**, create a simple text animation in the spirit of **La Linea** by using the symbols | and _. To slow down your animation, use the pause() function.
Resource: https://en.wikipedia.org/wiki/La_Linea_(TV_series)

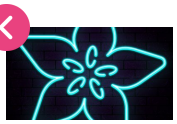
3. **Show the current state of the USER button** at each moment. What happens if you add a long sleep() inside your main loop? How to improve the responsiveness of your display?

4. **Display** the **value of all the inboard sensors**. Try to position each value at a strategic place to improve as much as possible the readability.

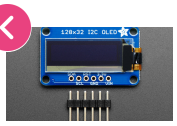
GOING FURTHER

I2C - Tutorial to learn all about the I2C communication protocol, why and how to use and implement it.
https://learn.sparkfun.com/tutorials/i2c/all

QWIIC/STEMMA - Keep the level shifting/regulator, to use it with Grove/Gravity/STEMMA/Qwiic controllers.
https://learn.adafruit.com/introducing-adafruit-stemma-qt/what-is-stemma-qt



OLED Display - Organic light-emitting diode (OLED or organic LED), known as organic electroluminescent (organic EL) diode.
https://en.wikipedia.org/wiki/OLED



Explore other activity sheets

R1AS09 - Make a tilt sensor with the accelerometer

R1AS11 - Make a very readable thermometer

R1AS15 - Collecting data