

## Ion Prototyping Lab: Modular Electronics

### Class 2: Feather RP2040

#### **Kit**

1. LEDs, resistors, 21 AWG wire
2. banana/grabber cables (2)
3. wire strippers
4. wireless prototyping board with Adafruit Feather RP2040
5. Windows laptop
6. USB/A - USB/C programming cable
7. Microsoft VS Code installed

#### **Setup**

1. Add a new folder for yourself on the desktop
2. Download python code modules from GitHub to a new directory on your laptop
3. Plug in the Feather RP2040 board with the USB cable
4. Verify that a new drive is visible : "Circuit Python"
5. Copy "Blink2.py" to "code.py" on the "Circuit Python" drive
6. Verify that an LED on the Feather is blinking at a frequency of 1 Hz (once per second)
7. (At the end of class, remove your new folder from the desktop)

#### **Introduction**

1. Integrated circuits
2. Microcontrollers
3. Pins and general purpose input/output (GPIO)
4. Python, Circuit Python
5. Microsoft Visual Studio Code workspace
6. Stand alone operation (power-on will run CODE.PY)

#### **Blink1 (running as CODE.PY)**

1. A close look at Blink1:  
pin definition "LED"

python variables

basic python syntax (indentation, assignment, conditionals)

## 2. Terminal commands:

CTL-S saves file CODE.PY and runs code

CTL-C stops execution

CTL-D starts execution

## 3. LED blinking

Verify blinking rate.

Change blinking rate. Make sure that you are editing CODE.PY

CTL-S saves file and runs code

## 4. Verify other pins are moving:

Change blinking rate to 2 seconds.

Probe A0, A1 pins with voltmeter. Voltage should be 0V for low, 3.3V for high.

## **Pins\_V1 (running as CODE.PY)**

This program configures A0, A1, A2, A3 as outputs and sets them to static values. Change the values and verify them with the DVM.

## **Pins\_V2**

This program configures 4 pins as outputs and 4 pins as inputs. It then drives the 4 output pins. Connect the output pins to the input pins as shown below. Then run the program and verify that the correct output values are read at the inputs.

A0 -> D4  
A1 -> D6  
A2 -> D24  
A3 -> D25

## **Pins\_V3**

This program drives an input (A0) with a switch. The input value is routed to an output, which controls an LED. When the program runs, the switch should control the LED.

Modify the program between the switch as a continuous push, and the switch as a toggle. In the second case, the input must control a state variable in the code, which toggles each time the input goes from low to high.