Adafruit CircuitPlayground Library Documentation

Release 1.0

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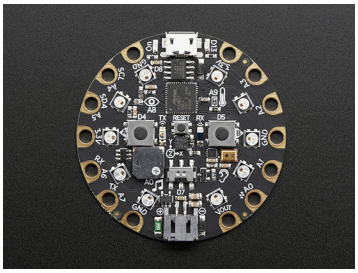
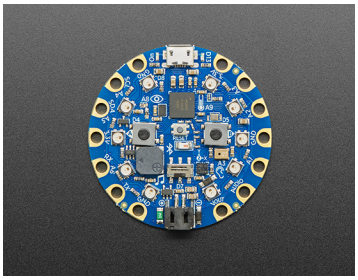
Contents

This high level library provides objects that represent Circuit Playground Express and Bluefruit hardware.





CHAPTER 1

Installation

For Circuit Playground Express, simply install CircuitPython to use this library - the library itself and all of its dependencies are built into CircuitPython for Circuit Playground Express.

For Circuit Playground Bluefruit, you must install this library and all of its dependencies. Please download the latest Adafruit CircuitPython library bundle. Open the resulting zip file, open the lib folder within, and copy the following folders and files to the lib folder on your CIRCUITPY drive:

- adafruit_bus_device/
- adafruit_circuitplayground/
- adafruit_lis3dh.mpy
- adafruit_thermistor.mpy
- neopixel.mpy

CHAPTER 2

Usage Example

Using this library is super simple. Simply import the `cp` variable from the module and then use it.

```
from adafruit_circuitplayground import cp

while True:
    if cp.button_a:
        print("Temperature:", cp.temperature)
    cp.red_led = cp.button_b
```

To learn more about all the features of this library, check out the CircuitPython Made Easy on Circuit Playground Express and Bluefruit guide on the Adafruit Learn System.

CHAPTER 3

Circuit Playground Library Details

For a detailed explanation of how the Circuit Playground library functions, see The Technical Side page of the CircuitPython Made Easy on Circuit Playground Express and Bluefruit guide.

CHAPTER 4

Contributing

Contributions are welcome! Please read our Code of Conduct before contributing to help this project stay welcoming.

CHAPTER 5

Documentation

For information on building library documentation, please check out this guide.

CHAPTER 6

Table of Contents

6.1 Simple test

Ensure your device works with this simple test.

Listing 1: examples/circuitplayground_acceleration.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""
This example uses the accelerometer on the Circuit Playground. It prints the values. Try moving
the board to see the values change. If you're using Mu, open the plotter to see the values plotted.
"""
import time
from adafruit_circuitplayground import cp

while True:
    x, y, z = cp.acceleration
    print((x, y, z))

    time.sleep(0.1)
```

Listing 2: examples/circuitplayground_pixels_simpletest.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example lights up the NeoPixels with a rainbow swirl."""
import time
from adafruit_circuitplayground import cp

```

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```

def wheel(pos):
    # Input a value 0 to 255 to get a color value.
    # The colours are a transition r - g - b - back to r.
    if (pos < 0) or (pos > 255):
        return (0, 0, 0)
    if pos < 85:
        return (int(pos * 3), int(255 - (pos * 3)), 0)
    if pos < 170:
        pos -= 85
        return (int(255 - pos * 3), 0, int(pos * 3))
    pos -= 170
    return (0, int(pos * 3), int(255 - pos * 3))


def rainbow_cycle(wait):
    for j in range(255):
        for i in range(cp.pixels.n):
            idx = int((i * 256 / len(cp.pixels)) + j)
            cp.pixels[i] = wheel(idx & 255)
        cp.pixels.show()
        time.sleep(wait)


cp.pixels.auto_write = False
cp.pixels.brightness = 0.3
while True:
    rainbow_cycle(0.001)  # rainbowcycle with 1ms delay per step
```

Listing 3: examples/circuitplayground_shake.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example prints to the serial console when the Circuit Playground is shaken."""
from adafruit_circuitplayground import cp

while True:
    if cp.shake():
        print("Shake detected!")
```

Listing 4: examples/circuitplayground_tapdetect_single_double.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example shows how you can use single-tap and double-tap together with a delay␣
↪between.
Single-tap the board twice and then double-tap the board twice to complete the␣
↪program."""
from adafruit_circuitplayground import cp

# Set to check for single-taps.
cp.detect_taps = 1
tap_count = 0

```

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```
# We're looking for 2 single-taps before moving on.
while tap_count < 2:
    if cp.tapped:
        tap_count += 1
print("Reached 2 single-taps!")

# Now switch to checking for double-taps
tap_count = 0
cp.detect_taps = 2

# We're looking for 2 double-taps before moving on.
while tap_count < 2:
    if cp.tapped:
        tap_count += 1
print("Reached 2 double-taps!")
print("Done.")
while True:
    cp.red_led = True
```

Listing 5: examples/circuitplayground_tapdetect.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example prints to the serial console when the board is double-tapped."""
import time
from adafruit_circuitplayground import cp

# Change to 1 for single-tap detection.
cp.detect_taps = 2

while True:
    if cp.tapped:
        print("Tapped!")
    time.sleep(0.05)
```

Listing 6: examples/circuitplayground_tone.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example plays a different tone for each button, while the button is pressed."
↪"
from adafruit_circuitplayground import cp

while True:
    if cp.button_a:
        cp.start_tone(262)
    elif cp.button_b:
        cp.start_tone(294)
    else:
        cp.stop_tone()
```

Listing 7: examples/circuitplayground_touched.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example prints to the serial console when you touch the capacitive touch pads.
"""
from adafruit_circuitplayground import cp

while True:
    if cp.touch_A1:
        print("Touched pad A1")
    if cp.touch_A2:
        print("Touched pad A2")
    if cp.touch_A3:
        print("Touched pad A3")
    if cp.touch_A4:
        print("Touched pad A4")
    if cp.touch_A5:
        print("Touched pad A5")
    if cp.touch_A6:
        print("Touched pad A6")
    if cp.touch_TX:
        print("Touched pad TX")
```

Listing 8: examples/circuitplayground_acceleration_neopixels.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""If the switch is to the right, it will appear that nothing is happening. Move the␣
↪switch to the
left to see the NeoPixels light up in colors related to the accelerometer! The␣
↪Circuit Playground
has an accelerometer in the center that returns (x, y, z) acceleration values. This␣
↪program uses
those values to light up the NeoPixels based on those acceleration values."""
from adafruit_circuitplayground import cp

# Main loop gets x, y and z axis acceleration, prints the values, and turns on
# red, green and blue, at levels related to the x, y and z values.
while True:
    if not cp.switch:
        # If the switch is to the right, it returns False!
        print("Slide switch off!")
        cp.pixels.fill((0, 0, 0))
        continue
    R = 0
    G = 0
    B = 0
    x, y, z = cp.acceleration
    print((x, y, z))
    cp.pixels.fill(((R + abs(int(x))), (G + abs(int(y))), (B + abs(int(z)))))
```

Listing 9: examples/circuitplayground_button_a.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example turns on the little red LED when button A is pressed."""
from adafruit_circuitplayground import cp

while True:
    if cp.button_a:
        print("Button A pressed!")
        cp.red_led = True
```

Listing 10: examples/circuitplayground_button_b.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example turns the little red LED on only while button B is currently being␣
↪pressed."""
from adafruit_circuitplayground import cp

# This code is written to be readable versus being Pylint compliant.
# pylint: disable=simplifiable-if-statement

while True:
    if cp.button_b:
        cp.red_led = True
    else:
        cp.red_led = False

# Can also be written as:
#    cp.red_led = cp.button_b
```

Listing 11: examples/circuitplayground_buttons_1_neopixel.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example lights up the third NeoPixel while button A is being pressed, and␣
↪lights up the
eighth NeoPixel while button B is being pressed."""
from adafruit_circuitplayground import cp

cp.pixels.brightness = 0.3
cp.pixels.fill((0, 0, 0))  # Turn off the NeoPixels if they're on!

while True:
    if cp.button_a:
        cp.pixels[2] = (0, 255, 0)
    else:
        cp.pixels[2] = (0, 0, 0)

    if cp.button_b:
        cp.pixels[7] = (0, 0, 255)
    else:
```

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```
        cp.pixels[7] = (0, 0, 0)
```

Listing 12: examples/circuitplayground_buttons_neopixels.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example lights up half the NeoPixels red while button A is being pressed, and half the
NeoPixels green while button B is being pressed."""
from adafruit_circuitplayground import cp

cp.pixels.brightness = 0.3
cp.pixels.fill((0, 0, 0))  # Turn off the NeoPixels if they're on!

while True:
    if cp.button_a:
        cp.pixels[0:5] = [(255, 0, 0)] * 5
    else:
        cp.pixels[0:5] = [(0, 0, 0)] * 5

    if cp.button_b:
        cp.pixels[5:10] = [(0, 255, 0)] * 5
    else:
        cp.pixels[5:10] = [(0, 0, 0)] * 5
```

Listing 13: examples/circuitplayground_ir_receive.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""THIS EXAMPLE REQUIRES A SEPARATE LIBRARY BE LOADED ONTO YOUR CIRCUITPY DRIVE.
This example requires the adafruit_irremote.mpy library.

THIS EXAMPLE WORKS WITH CIRCUIT PLAYGROUND EXPRESS ONLY.

This example uses the IR receiver found near the center of the board. Works with another Circuit
Playground Express running the circuitplayground_ir_transmit.py example. The NeoPixels will light
up when the buttons on the TRANSMITTING Circuit Playground Express are pressed!"""
import pulseio
import board
import adafruit_irremote
from adafruit_circuitplayground import cp

# Create a 'pulseio' input, to listen to infrared signals on the IR receiver
try:
    pulsein = pulseio.PulseIn(board.IR_RX, maxlen=120, idle_state=True)
except AttributeError as err:
    raise NotImplementedError(
        "This example does not work with Circuit Playground Bluefruti!"
    ) from err

# Create a decoder that will take pulses and turn them into numbers
decoder = adafruit_irremote.GenericDecode()
```

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```

while True:
    cp.red_led = True
    pulses = decoder.read_pulses(pulsein)
    try:
        # Attempt to convert received pulses into numbers
        received_code = decoder.decode_bits(pulses)
    except adafruit_irremote.IRNECRepeatException:
        # We got an unusual short code, probably a 'repeat' signal
        continue
    except adafruit_irremote.IRDecodeException:
        # Something got distorted
        continue

    print("Infrared code received: ", received_code)
    if received_code == [66, 84, 78, 65]:
        print("Button A signal")
        cp.pixels.fill((100, 0, 155))
    if received_code == [66, 84, 78, 64]:
        print("Button B Signal")
        cp.pixels.fill((210, 45, 0))
```

Listing 14: examples/circuitplayground_ir_transmit.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""THIS EXAMPLE REQUIRES A SEPARATE LIBRARY BE LOADED ONTO YOUR CIRCUITPY DRIVE.
This example requires the adafruit_irremote.mpy library.

THIS EXAMPLE WORKS WITH CIRCUIT PLAYGROUND EXPRESS ONLY.

This example uses the IR transmitter found near the center of the board. Works with␣
↪another Circuit
Playground Express running the circuitplayground_ir_receive.py example. Press the␣
↪buttons to light
up the NeoPixels on the RECEIVING Circuit Playground Express!"""
import time
import pulseio
import pwmio
import board
import adafruit_irremote
from adafruit_circuitplayground import cp

# Create a 'pwmio' output, to send infrared signals from the IR transmitter
try:
    pwm = pwmio.PWMOut(board.IR_TX, frequency=38000, duty_cycle=2 ** 15)
except AttributeError as err:
    raise NotImplementedError(
        "This example does not work with Circuit Playground Bluefruit!"
    ) from err

pulseout = pulseio.PulseOut(pwm)  # pylint: disable=no-member
# Create an encoder that will take numbers and turn them into NEC IR pulses
encoder = adafruit_irremote.GenericTransmit(
    header=[9500, 4500], one=[550, 550], zero=[550, 1700], trail=0
```

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```
)

while True:
    if cp.button_a:
        print("Button A pressed! \n")
        cp.red_led = True
        encoder.transmit(pulseout, [66, 84, 78, 65])
        cp.red_led = False
        # wait so the receiver can get the full message
        time.sleep(0.2)
    if cp.button_b:
        print("Button B pressed! \n")
        cp.red_led = True
        encoder.transmit(pulseout, [66, 84, 78, 64])
        cp.red_led = False
        time.sleep(0.2)
```

Listing 15: examples/circuitplayground_light_neopixels.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""
This example uses the light sensor on the Circuit Playground, located next to the␣
↪picture of the
eye on the board. Once you have the library loaded, try shining a flashlight on your␣
↪Circuit
Playground to watch the number of NeoPixels lit up increase, or try covering up the␣
↪light sensor
to watch the number decrease.
"""

import time
from adafruit_circuitplayground import cp

cp.pixels.auto_write = False
cp.pixels.brightness = 0.3


def scale_range(value):
    """Scale a value from 0-320 (light range) to 0-9 (NeoPixel range).
    Allows remapping light value to pixel position."""
    return round(value / 320 * 9)


while True:
    peak = scale_range(cp.light)
    print(cp.light)
    print(int(peak))

    for i in range(10):
        if i <= peak:
            cp.pixels[i] = (0, 255, 255)
        else:
            cp.pixels[i] = (0, 0, 0)
    cp.pixels.show()
    time.sleep(0.05)
```

Listing 16: examples/circuitplayground_light.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example uses the light sensor on your Circuit Playground, located next to the picture of
the eye. Try shining a flashlight on your Circuit Playground, or covering the light sensor with
your finger to see the values increase and decrease."""
import time
from adafruit_circuitplayground import cp

while True:
    print("Light:", cp.light)
    time.sleep(0.2)
```

Listing 17: examples/circuitplayground_neopixel_0_1.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example lights up the first and second NeoPixel, red and blue respectively."""
from adafruit_circuitplayground import cp

cp.pixels.brightness = 0.3

while True:
    cp.pixels[0] = (255, 0, 0)
    cp.pixels[1] = (0, 0, 255)
```

Listing 18: examples/circuitplayground_light_plotter.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""If you're using Mu, this example will plot the light levels from the light sensor (located next
to the eye) on your Circuit Playground. Try shining a flashlight on your Circuit Playground, or
covering the light sensor to see the plot increase and decrease."""
import time
from adafruit_circuitplayground import cp

while True:
    print("Light:", cp.light)
    print((cp.light,))
    time.sleep(0.1)
```

Listing 19: examples/circuitplayground_play_file_buttons.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""THIS EXAMPLE REQUIRES A WAV FILE FROM THE examples FOLDER IN THE
Adafruit_CircuitPython_CircuitPlayground REPO found at:
```

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```
https://github.com/adafruit/Adafruit_CircuitPython_CircuitPlayground/tree/main/examples

Copy the "dip.wav" and "rise.wav" files to your CIRCUITPY drive.

Once the files are copied, this example plays a different wav file for each button pressed!"""
from adafruit_circuitplayground import cp

while True:
    if cp.button_a:
        cp.play_file("dip.wav")
    if cp.button_b:
        cp.play_file("rise.wav")
```

Listing 20: examples/circuitplayground_play_file.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""THIS EXAMPLE REQUIRES A WAV FILE FROM THE examples FOLDER IN THE
Adafruit_CircuitPython_CircuitPlayground REPO found at:
https://github.com/adafruit/Adafruit_CircuitPython_CircuitPlayground/tree/main/examples

Copy the "dip.wav" file to your CIRCUITPY drive.

Once the file is copied, this example plays a wav file!"""
from adafruit_circuitplayground import cp

cp.play_file("dip.wav")
```

Listing 21: examples/circuitplayground_play_tone_buttons.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example plays a different tone for a duration of 1 second for each button pressed."""
from adafruit_circuitplayground import cp

while True:
    if cp.button_a:
        cp.play_tone(262, 1)
    if cp.button_b:
        cp.play_tone(294, 1)
```

Listing 22: examples/circuitplayground_play_tone.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example plays two tones for 1 second each. Note that the tones are not in a loop - this is
to prevent them from playing indefinitely!"""
```

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```
from adafruit_circuitplayground import cp

cp.play_tone(262, 1)
cp.play_tone(294, 1)
```

Listing 23: examples/circuitplayground_red_led_blinky.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This is the "Hello, world!" of CircuitPython: Blinky! This example blinks the little red LED on
and off!"""
import time
from adafruit_circuitplayground import cp

while True:
    cp.red_led = True
    time.sleep(0.5)
    cp.red_led = False
    time.sleep(0.5)
```

Listing 24: examples/circuitplayground_red_led_blnky_short.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This is the "Hello, world!" of CircuitPython: Blinky! This example blinks the little red LED on
and off! It's a shorter version of the other Blinky example."""
import time
from adafruit_circuitplayground import cp

while True:
    cp.red_led = not cp.red_led
    time.sleep(0.5)
```

Listing 25: examples/circuitplayground_red_led.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example turns on the little red LED."""
from adafruit_circuitplayground import cp

while True:
    cp.red_led = True
```

Listing 26: examples/circuitplayground_slide_switch_red_led.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example uses the slide switch to control the little red LED."""
from adafruit_circuitplayground import cp
```

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```

# This code is written to be readable versus being Pylint compliant.
# pylint: disable=simplifiable-if-statement

while True:
    if cp.switch:
        cp.red_led = True
    else:
        cp.red_led = False
```

Listing 27: examples/circuitplayground_slide_switch_red_led_short.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example uses the slide switch to control the little red LED. When the switch␣
↪is to the
right it returns False, and when it's to the left, it returns True."""
from adafruit_circuitplayground import cp

while True:
    cp.red_led = cp.switch
```

Listing 28: examples/circuitplayground_slide_switch.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example prints the status of the slide switch. Try moving the switch back and␣
↪forth to see
what's printed to the serial console!"""
import time
from adafruit_circuitplayground import cp

while True:
    print("Slide switch:", cp.switch)
    time.sleep(0.1)
```

Listing 29: examples/circuitplayground_sound_meter.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example uses the sound sensor, located next to the picture of the ear on your␣
↪board, to
light up the NeoPixels as a sound meter. Try talking to your Circuit Playground or␣
↪clapping, etc,
to see the NeoPixels light up!"""
import array
import math
import board
import audiobusio
from adafruit_circuitplayground import cp


```

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```
def constrain(value, floor, ceiling):
    return max(floor, min(value, ceiling))


def log_scale(input_value, input_min, input_max, output_min, output_max):
    normalized_input_value = (input_value - input_min) / (input_max - input_min)
    return output_min + math.pow(normalized_input_value, 0.630957) * (
        output_max - output_min
    )


def normalized_rms(values):
    minbuf = int(sum(values) / len(values))
    return math.sqrt(
        sum(float(sample - minbuf) * (sample - minbuf) for sample in values)
        / len(values)
    )


mic = audiobusio.PDMIn(
    board.MICROPHONE_CLOCK, board.MICROPHONE_DATA, sample_rate=16000, bit_depth=16
)

samples = array.array("H", [0] * 160)
mic.record(samples, len(samples))
input_floor = normalized_rms(samples) + 10

# Lower number means more sensitive - more LEDs will light up with less sound.
sensitivity = 500
input_ceiling = input_floor + sensitivity

peak = 0
while True:
    mic.record(samples, len(samples))
    magnitude = normalized_rms(samples)
    print((magnitude,))

    c = log_scale(
        constrain(magnitude, input_floor, input_ceiling),
        input_floor,
        input_ceiling,
        0,
        10,
    )

    cp.pixels.fill((0, 0, 0))
    for i in range(10):
        if i < c:
            cp.pixels[i] = (i * (255 // 10), 50, 0)
        if c >= peak:
            peak = min(c, 10 - 1)
        elif peak > 0:
            peak = peak - 1
        if peak > 0:
            cp.pixels[int(peak)] = (80, 0, 255)
    cp.pixels.show()
```

Listing 30: examples/circuitplayground_tap_red_led.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example turns on the little red LED and prints to the serial console when you␣
↪double-tap
the Circuit Playground!"""
import time
from adafruit_circuitplayground import cp

# Change to 1 for detecting a single-tap!
cp.detect_taps = 2

while True:
    if cp.tapped:
        print("Tapped!")
        cp.red_led = True
        time.sleep(0.1)
    else:
        cp.red_led = False
```

Listing 31: examples/circuitplayground_temperature_neopixels.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""
This example use the temperature sensor on the Circuit Playground, located next to␣
↪the picture of
the thermometer on the board. Try warming up the board to watch the number of␣
↪NeoPixels lit up
increase, or cooling it down to see the number decrease. You can set the min and max␣
↪temperatures
to make it more or less sensitive to temperature changes.
"""
import time
from adafruit_circuitplayground import cp

cp.pixels.auto_write = False
cp.pixels.brightness = 0.3

# Set these based on your ambient temperature in Celsius for best results!
minimum_temp = 24
maximum_temp = 30


def scale_range(value):
    """Scale a value from the range of minimum_temp to maximum_temp (temperature␣
↪range) to 0-10
    (the number of NeoPixels). Allows remapping temperature value to pixel position.""
↪"
    return int((value - minimum_temp) / (maximum_temp - minimum_temp) * 10)


while True:
    peak = scale_range(cp.temperature)
```

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```
    print(cp.temperature)
    print(int(peak))

    for i in range(10):
        if i <= peak:
            cp.pixels[i] = (0, 255, 255)
        else:
            cp.pixels[i] = (0, 0, 0)
    cp.pixels.show()
    time.sleep(0.05)
```

Listing 32: examples/circuitplayground_temperature_plotter.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""If you're using Mu, this example will plot the temperature in C and F on the␣
↪plotter! Click
"Plotter" to open it, and place your finger over the sensor to see the numbers change.
↪ The
sensor is located next to the picture of the thermometer on the CPX."""
import time
from adafruit_circuitplayground import cp

while True:
    print("Temperature C:", cp.temperature)
    print("Temperature F:", cp.temperature * 1.8 + 32)
    print((cp.temperature, cp.temperature * 1.8 + 32))
    time.sleep(0.1)
```

Listing 33: examples/circuitplayground_temperature.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example uses the temperature sensor on the Circuit Playground, located next␣
↪to the image of
a thermometer on the board. It prints the temperature in both C and F to the serial␣
↪console. Try
putting your finger over the sensor to see the numbers change!"""
import time
from adafruit_circuitplayground import cp

while True:
    print("Temperature C:", cp.temperature)
    print("Temperature F:", cp.temperature * 1.8 + 32)
    time.sleep(1)
```

Listing 34: examples/circuitplayground_touch_pixel_fill_rainbow.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example uses the capacitive touch pads on the Circuit Playground. They are␣
↪located around
```

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```
the outer edge of the board and are labeled A1-A6 and TX. (A0 is not a touch pad.) This example
lights up all the NeoPixels a different color of the rainbow for each pad touched!"""
import time
from adafruit_circuitplayground import cp

cp.pixels.brightness = 0.3

while True:
    if cp.touch_A1:
        print("Touched A1!")
        cp.pixels.fill((255, 0, 0))
    if cp.touch_A2:
        print("Touched A2!")
        cp.pixels.fill((210, 45, 0))
    if cp.touch_A3:
        print("Touched A3!")
        cp.pixels.fill((155, 100, 0))
    if cp.touch_A4:
        print("Touched A4!")
        cp.pixels.fill((0, 255, 0))
    if cp.touch_A5:
        print("Touched A5!")
        cp.pixels.fill((0, 135, 125))
    if cp.touch_A6:
        print("Touched A6!")
        cp.pixels.fill((0, 0, 255))
    if cp.touch_TX:
        print("Touched TX!")
        cp.pixels.fill((100, 0, 155))
    time.sleep(0.1)
```

Listing 35: examples/circuitplayground_touch_pixel_rainbow.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

"""This example uses the capacitive touch pads on the Circuit Playground. They are located around
the outer edge of the board and are labeled A1-A6 and TX. (A0 is not a touch pad.) This example
lights up the nearest NeoPixel to that pad a different color of the rainbow!"""
import time
from adafruit_circuitplayground import cp

cp.pixels.brightness = 0.3

while True:
    if cp.touch_A1:
        print("Touched A1!")
        cp.pixels[6] = (255, 0, 0)
    if cp.touch_A2:
        print("Touched A2!")
        cp.pixels[8] = (210, 45, 0)
    if cp.touch_A3:
        print("Touched A3!")
```

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```
        cp.pixels[9] = (155, 100, 0)
    if cp.touch_A4:
        print("Touched A4!")
        cp.pixels[0] = (0, 255, 0)
    if cp.touch_A5:
        print("Touched A5!")
        cp.pixels[1] = (0, 135, 125)
    if cp.touch_A6:
        print("Touched A6!")
        cp.pixels[3] = (0, 0, 255)
    if cp.touch_TX:
        print("Touched TX!")
        cp.pixels[4] = (100, 0, 155)
    time.sleep(0.1)
```

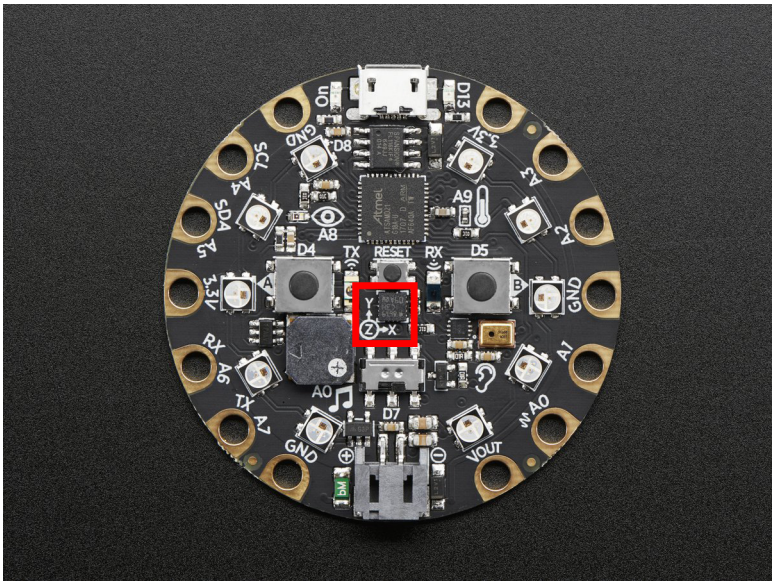
6.2 adafruit_circuitplayground.circuit_playground_base

CircuitPython base class for Circuit Playground.

- Circuit Playground Express
- Circuit Playground Bluefruit.
- Author(s): Kattni Rembor, Scott Shawcroft

class adafruit_circuitplayground.circuit_playground_base.**CircuitPlaygroundBase**
Circuit Playground base class.

acceleration
Obtain data from the x, y and z axes.



This example prints the values. Try moving the board to see how the printed values change.

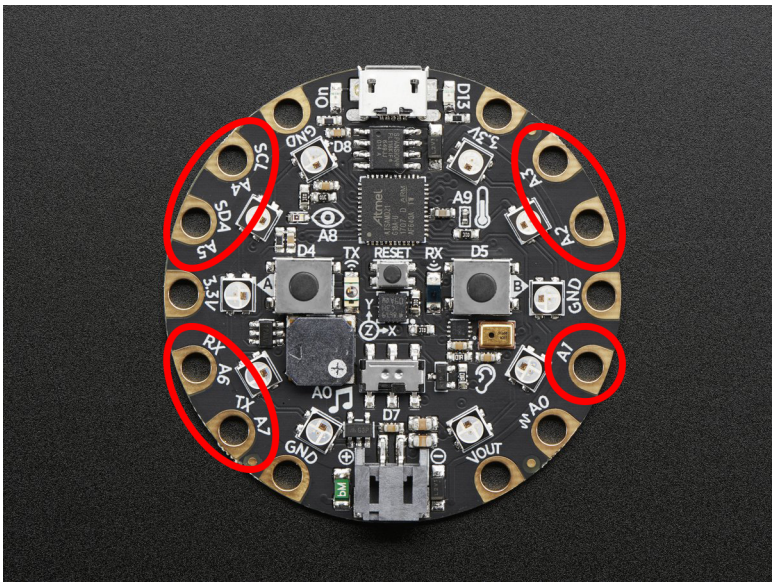
To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    x, y, z = cp.acceleration
    print(x, y, z)
```

adjust_touch_threshold(*adjustment*)

Adjust the threshold needed to activate the capacitive touch pads. Higher numbers make the touch pads less sensitive.

Parameters **adjustment** (*int*) – The desired threshold increase

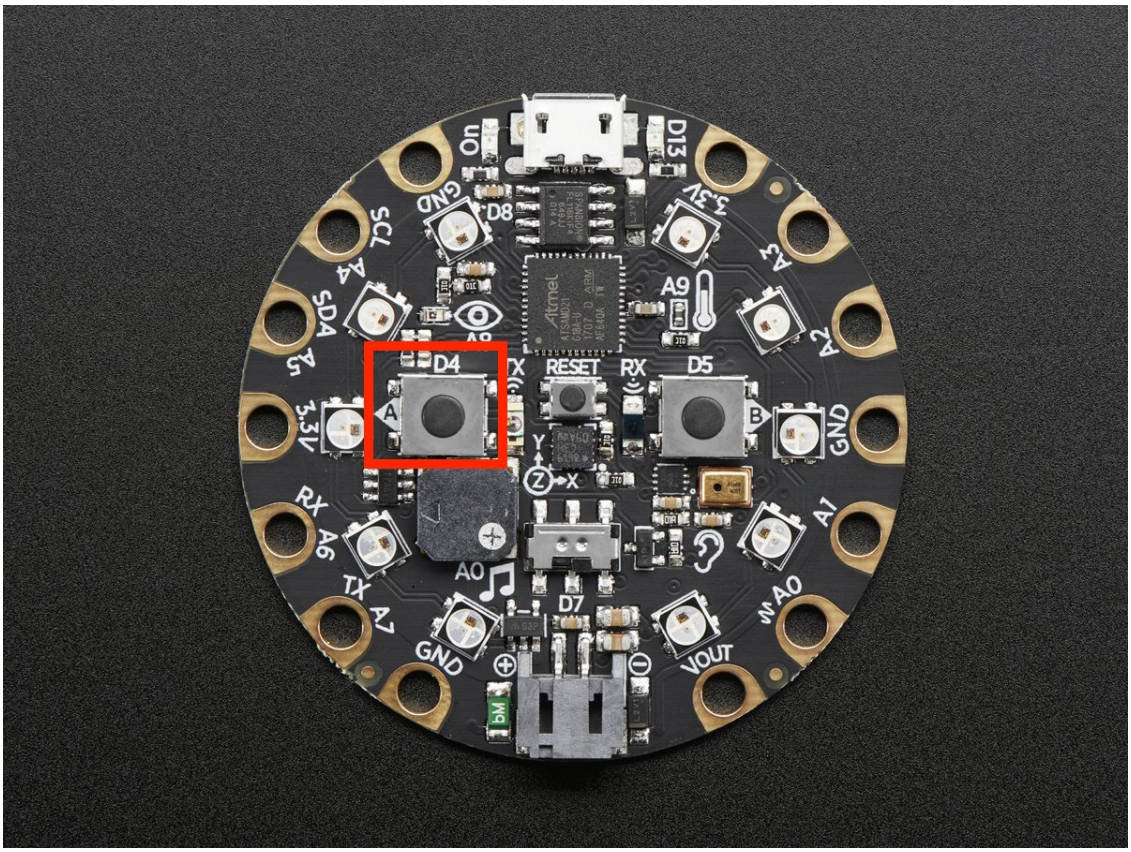


To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

cp.adjust_touch_threshold(200)

while True:
    if cp.touch_A1:
        print('Touched pad A1')
```

button_a

`True` when Button A is pressed. `False` if not.

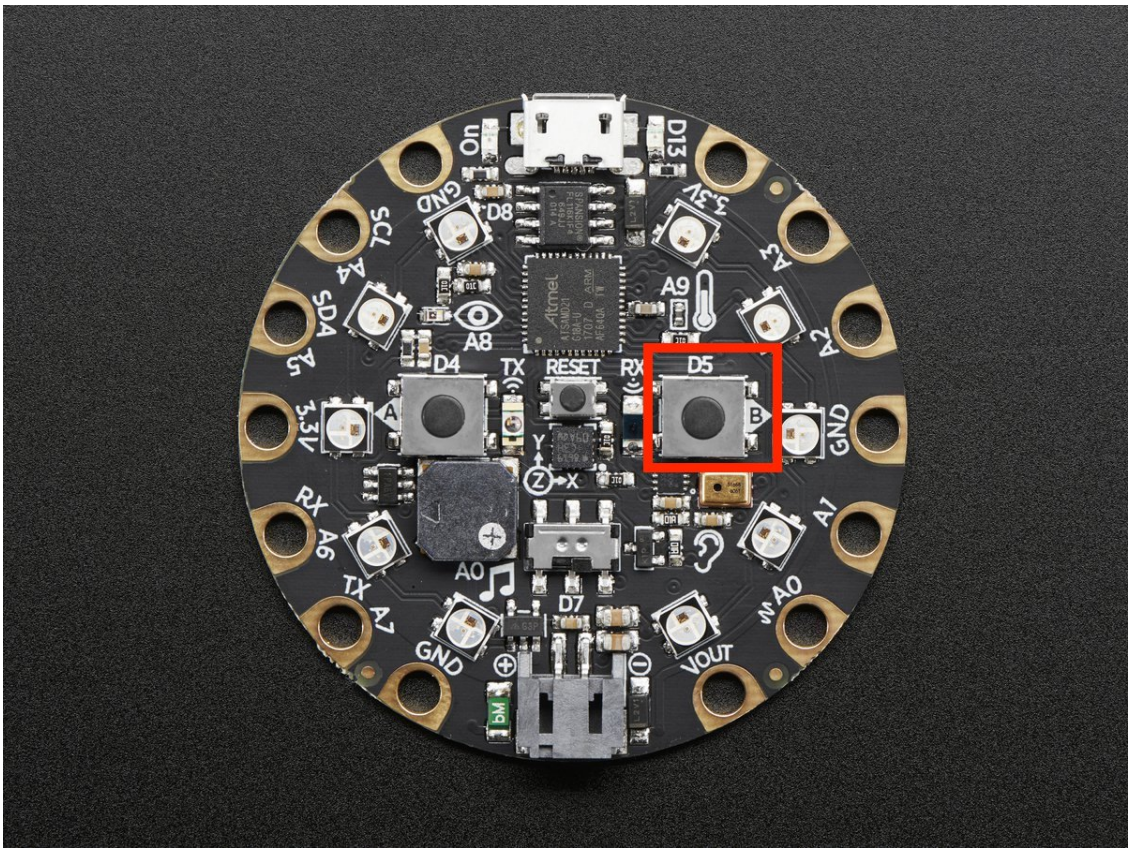


To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    if cp.button_a:
        print("Button A pressed!")
```

button_b

`True` when Button B is pressed. `False` if not.



To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    if cp.button_b:
        print("Button B pressed!")
```

configure_tap(*tap*, *accel_range=<sphinx.ext.autodoc.importer._MockObject object>*, *threshold=None*, *time_limit=None*, *time_latency=50*, *time_window=255*)

Granular configuration of tap parameters. Expose the power of the adafruit_lis3dh module.

Parameters

- **tap** (*int*) – 0 to disable tap detection, 1 to detect only single taps, and 2 to detect only double taps.
- **accel_range** (*int*) – Takes the defined values from the adafruit_lis3dh module [RANGE_2_G, RANGE_4_G, RANGE_8_G, RANGE_16_G] (default sets the same value as the *detect_taps* setter)
- **threshold** (*int*) – A threshold for the tap detection. The higher the value the less sensitive the detection. This changes based on the accelerometer range. Good values are 5-10 for 16G, 10-20 for 8G, 20-40 for 4G, and 40-80 for 2G. (default sets the same value as the *detect_taps* setter)
- **time_limit** (*int*) – TIME_LIMIT register value (default sets the same value as the *detect_taps* setter)
- **time_latency** (*int*) – TIME_LATENCY register value (default 50).

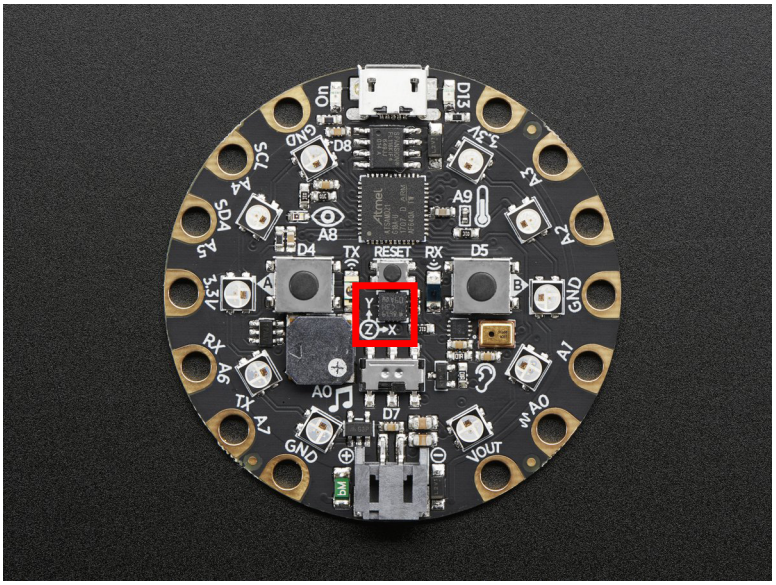
- **time_window** (*int*) – TIME_WINDOW register value (default 255).

To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp
import adafruit_lis3dh

cp.configure_tap(1, accel_range=adafruit_lis3dh.RANGE_2_G, threshold=50)
while True:
  if cp.tapped:
    print("Single tap detected!")
```

detect_taps

Configure what type of tap is detected by `cp.tapped`. Use `1` for single-tap detection and `2` for double-tap detection. This does nothing without `cp.tapped`.

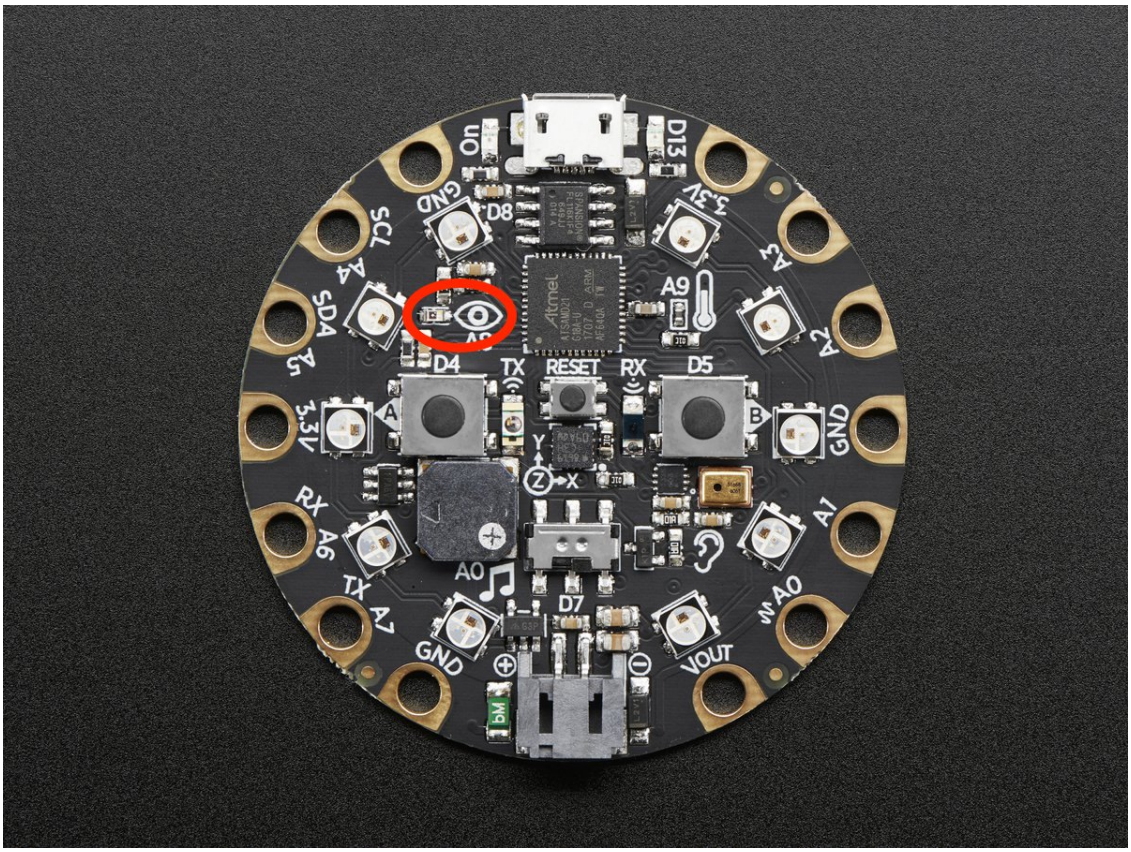


To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

cp.detect_taps = 1
while True:
  if cp.tapped:
    print("Single tap detected!")
```

light

The light level.



Try covering the sensor next to the eye to see it change.

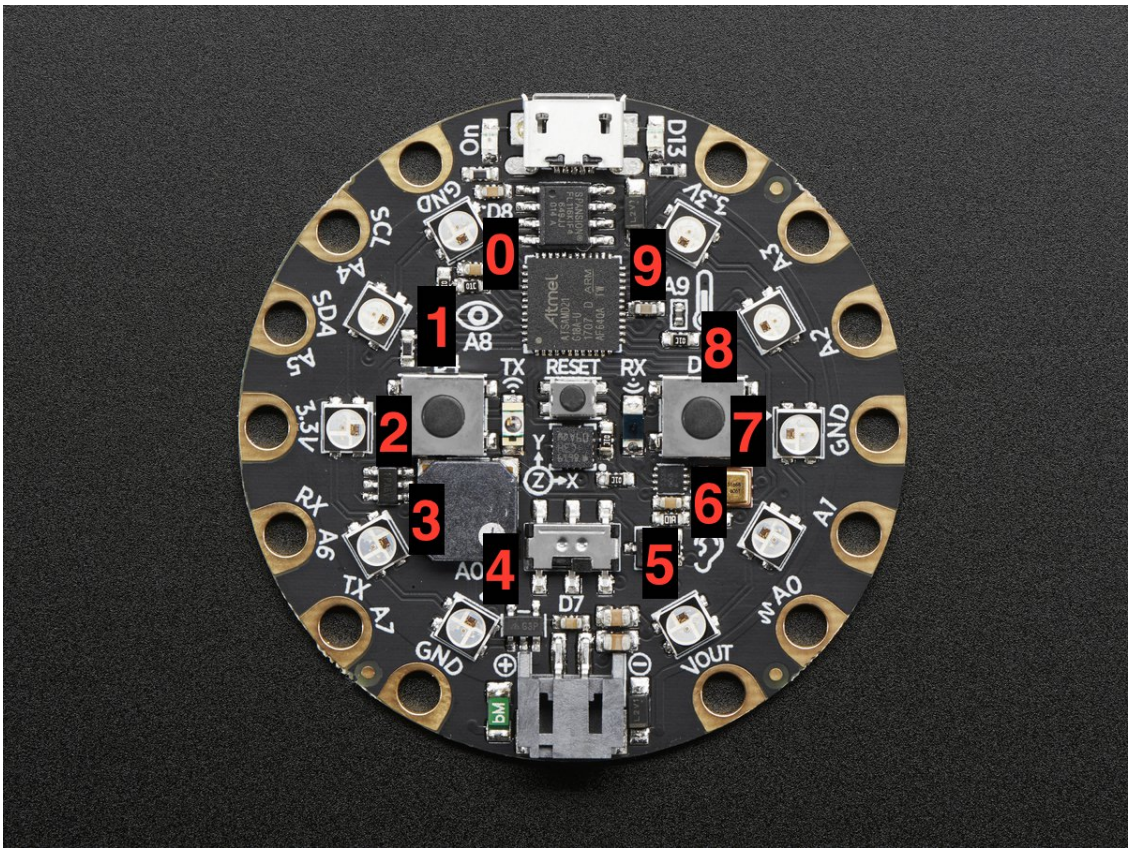
To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp
import time

while True:
    print("Light:", cp.light)
    time.sleep(1)
```

pixels

Sequence-like object representing the ten NeoPixels around the outside of the Circuit Playground. Each pixel is at a certain index in the sequence as labeled below. Colors can be RGB hex like 0x110000 for red where each two digits are a color (0xRRGGBB) or a tuple like (17, 0, 0) where (R, G, B). Set the global brightness using any number from 0 to 1 to represent a percentage, i.e. 0.3 sets global brightness to 30%.

See `neopixel.NeoPixel` for more info.



Here is an example that sets the first pixel green and the ninth red.

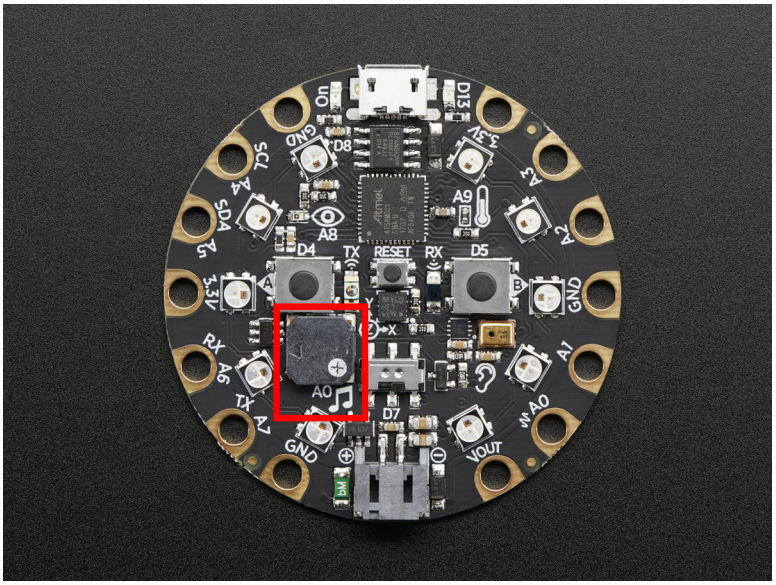
To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

cp.pixels.brightness = 0.3
cp.pixels[0] = 0x00FF00
cp.pixels[9] = (255, 0, 0)
```

play_file(*file_name*)

Play a .wav file using the onboard speaker.

Parameters **file_name** – The name of your .wav file in quotation marks including .wav



To use with the Circuit Playground Express or Bluefruit:

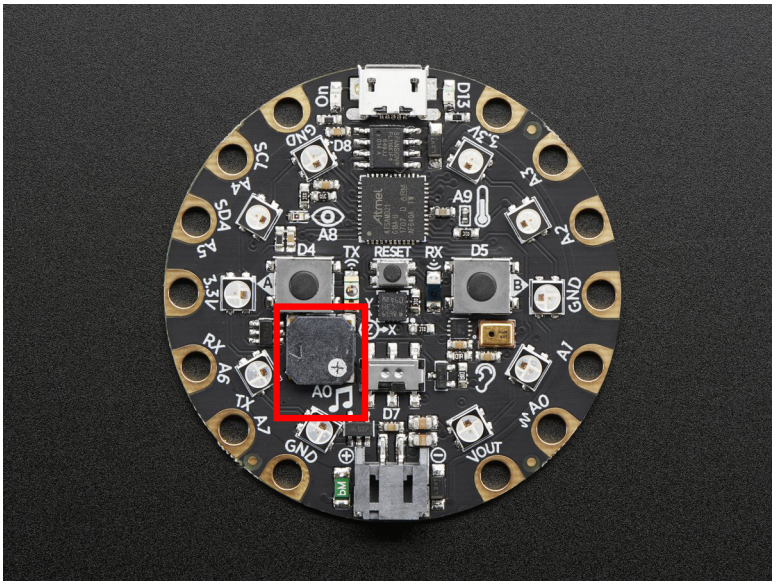
```
from adafruit_circuitplayground import cp

while True:
    if cp.button_a:
        cp.play_file("laugh.wav")
    elif cp.button_b:
        cp.play_file("rimshot.wav")
```

play_tone(*frequency*, *duration*)

Produce a tone using the speaker. Try changing frequency to change the pitch of the tone.

Parameters

- **frequency** (*int*) – The frequency of the tone in Hz
- **duration** (*float*) – The duration of the tone in seconds

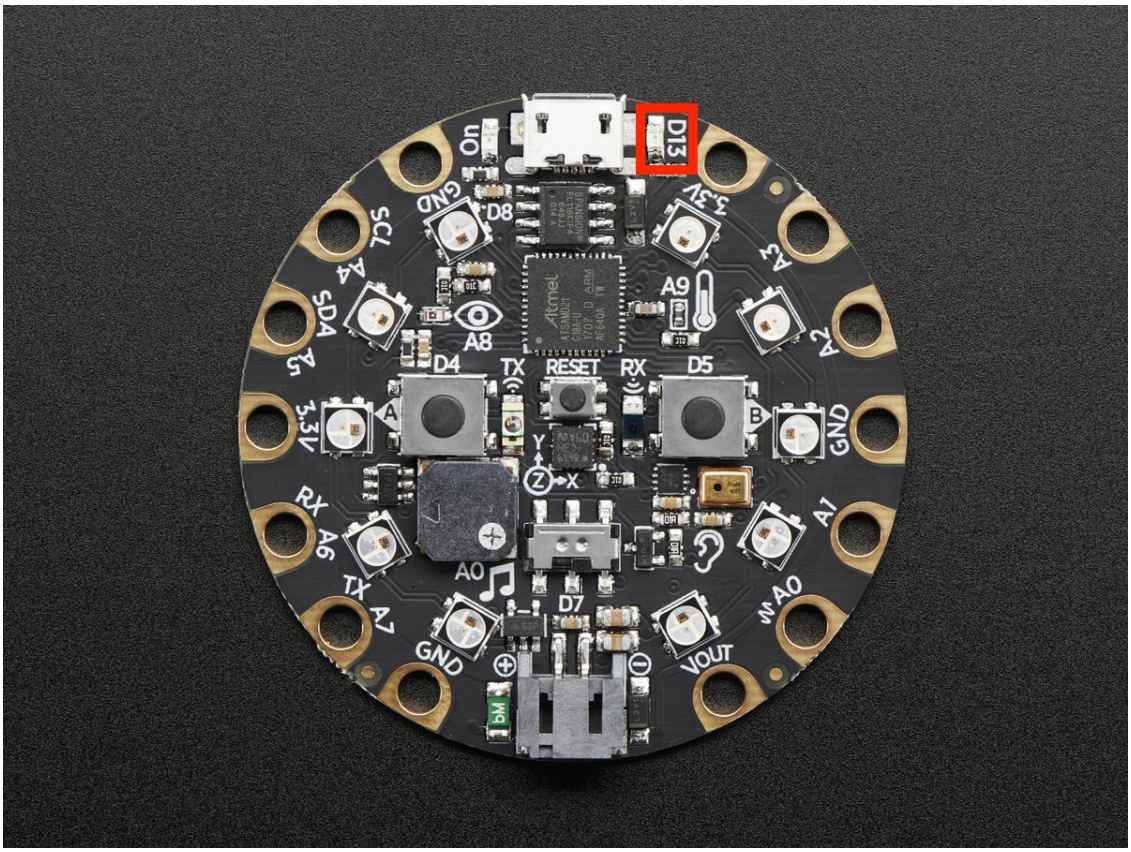


To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

cp.play_tone(440, 1)
```

red_led

The red led next to the USB plug marked D13.



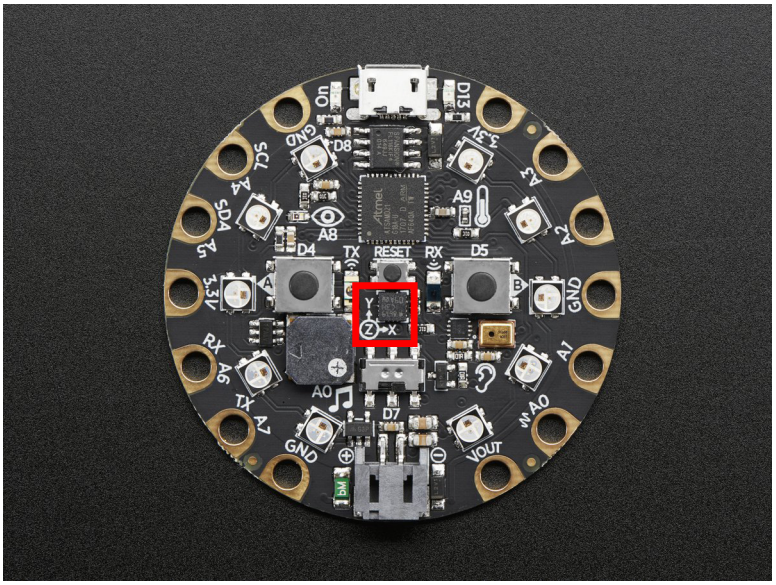
To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp
import time

while True:
    cp.red_led = True
    time.sleep(0.5)
    cp.red_led = False
    time.sleep(0.5)
```

shake(*shake_threshold=30*)

Detect when device is shaken.

Parameters **shake_threshold** (*int*) – The threshold shake must exceed to return true (Default: 30)



To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    if cp.shake():
        print("Shake detected!")
```

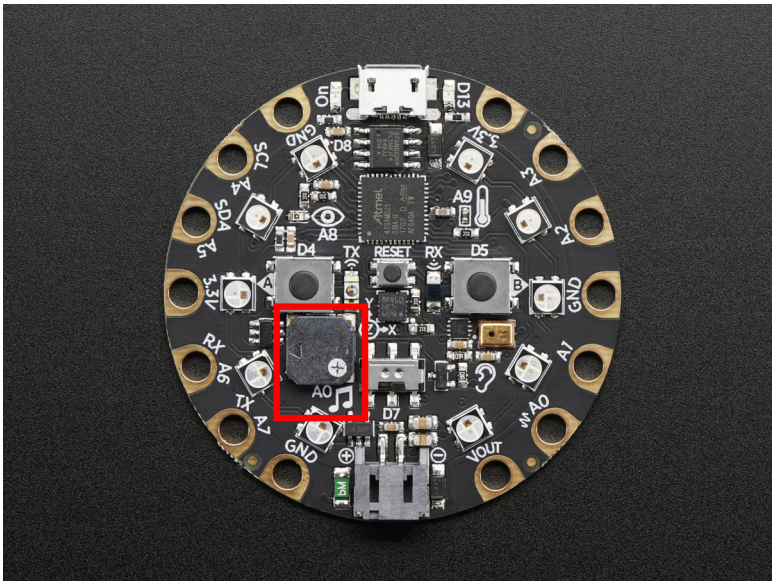
Decreasing `shake_threshold` increases shake sensitivity, i.e. the code will return a shake detected more easily with a lower `shake_threshold`. Increasing it causes the opposite. `shake_threshold` requires a minimum value of 10 - 10 is the value when the board is not moving, therefore anything less than 10 will erroneously report a constant shake detected.

```
from adafruit_circuitplayground import cp

while True:
    if cp.shake(shake_threshold=20):
        print("Shake detected more easily than before!")
```

start_tone (*frequency*)

Produce a tone using the speaker. Try changing frequency to change the pitch of the tone.

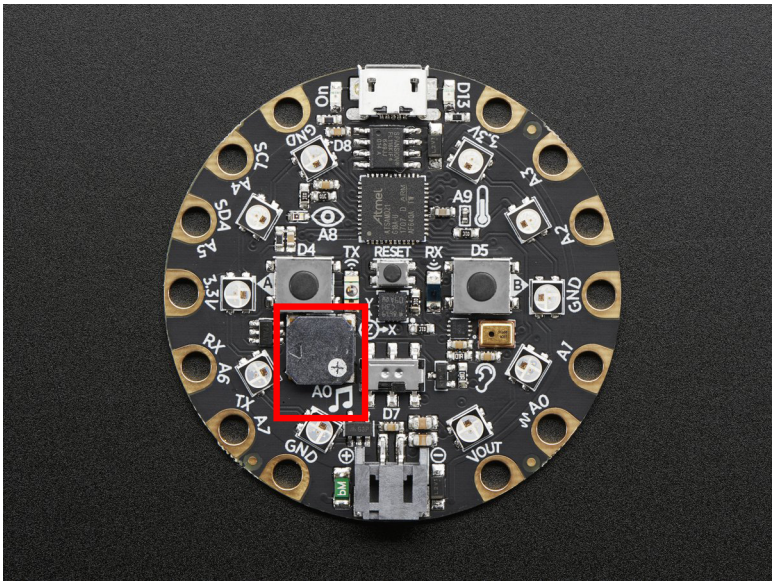
Parameters **frequency** (*int*) – The frequency of the tone in Hz



To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    if cp.button_a:
        cp.start_tone(262)
    elif cp.button_b:
        cp.start_tone(294)
    else:
        cp.stop_tone()
```

stop_tone()
Use with start_tone to stop the tone produced.

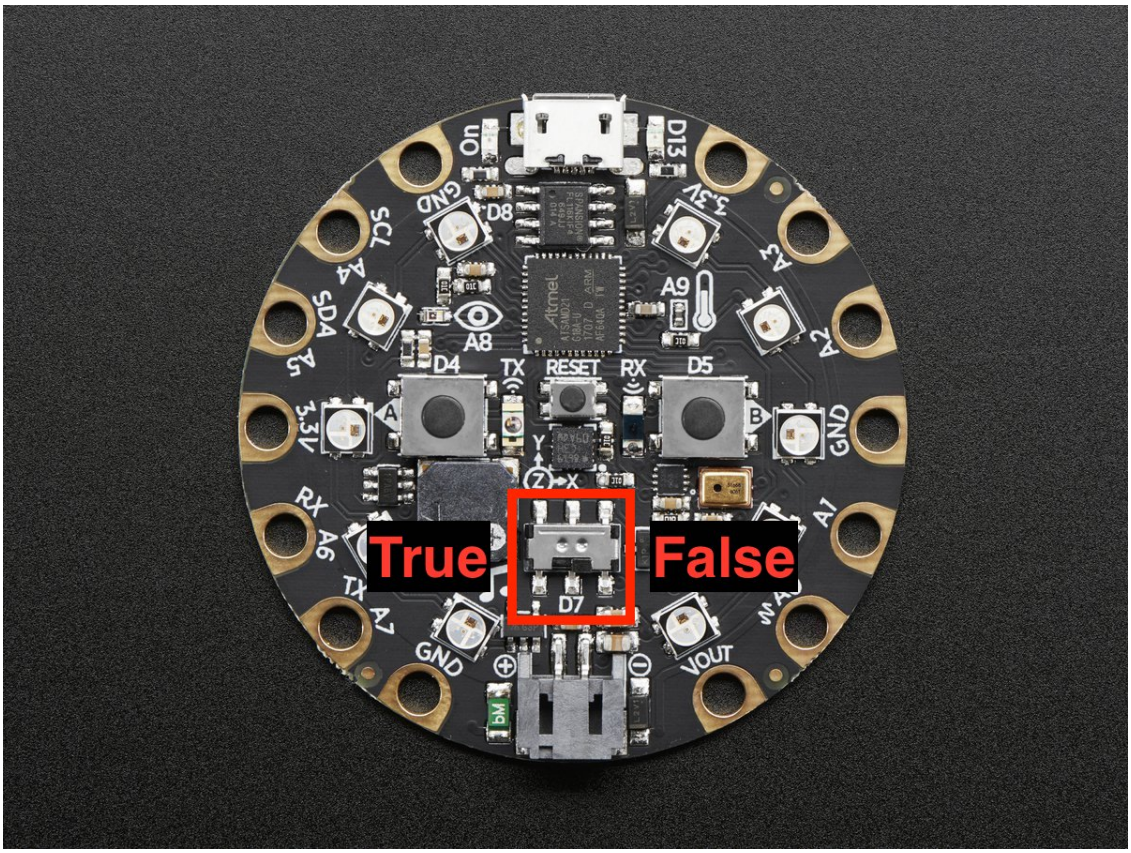


To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    if cp.button_a:
        cp.start_tone(262)
    elif cp.button_b:
        cp.start_tone(294)
    else:
        cp.stop_tone()
```

switch

`True` when the switch is to the left next to the music notes. `False` when it is to the right towards the ear.

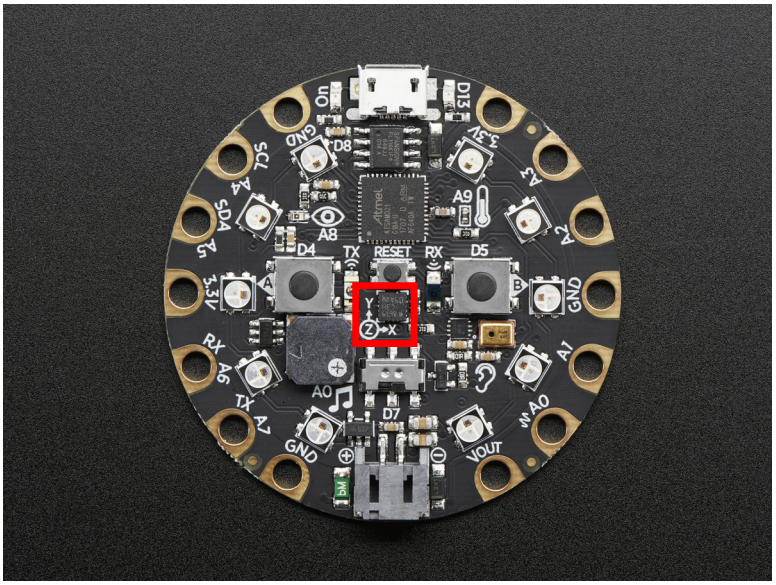


To use with the Circuit Playground Express or Bluefruit:

```
 from adafruit_circuitplayground import cp
import time

 while True:
     print("Slide switch:", cp.switch)
     time.sleep(0.1)
```

tapped

True once after a detecting a tap. Requires `cp.detect_taps`.



Tap the Circuit Playground once for a single-tap, or quickly tap twice for a double-tap.

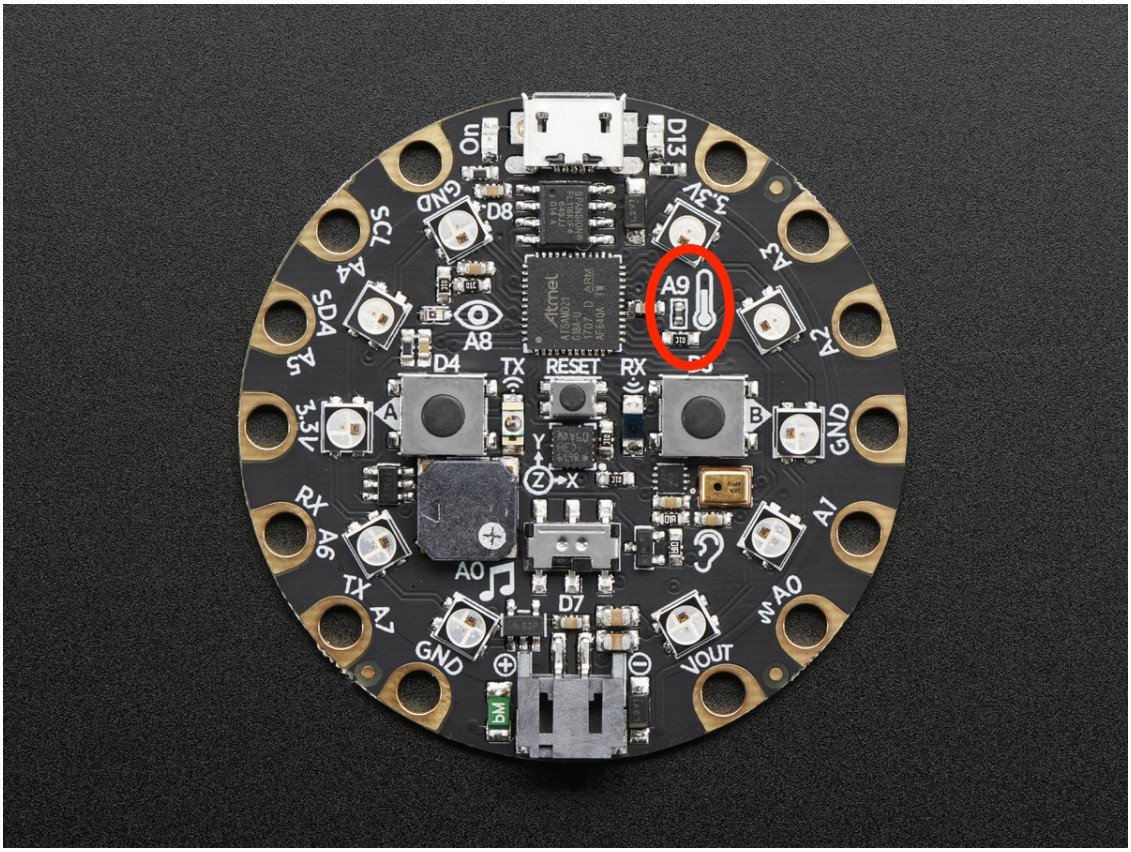
To use with Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

cp.detect_taps = 1

while True:
    if cp.tapped:
        print("Single tap detected!")
```

To use single and double tap together, you must have a delay between them. It will not function properly without it. This example uses both by counting a specified number of each type of tap before moving on in the code.

```
from adafruit_circuitplayground import cp

# Set to check for single-taps.
cp.detect_taps = 1
tap_count = 0

# We're looking for 2 single-taps before moving on.
while tap_count < 2:
    if cp.tapped:
        tap_count += 1
print("Reached 2 single-taps!")

# Now switch to checking for double-taps
tap_count = 0
cp.detect_taps = 2

# We're looking for 2 double-taps before moving on.
while tap_count < 2:
    if cp.tapped:
        tap_count += 1
print("Reached 2 double-taps!")
print("Done.")
```

temperature
The temperature in Celsius.

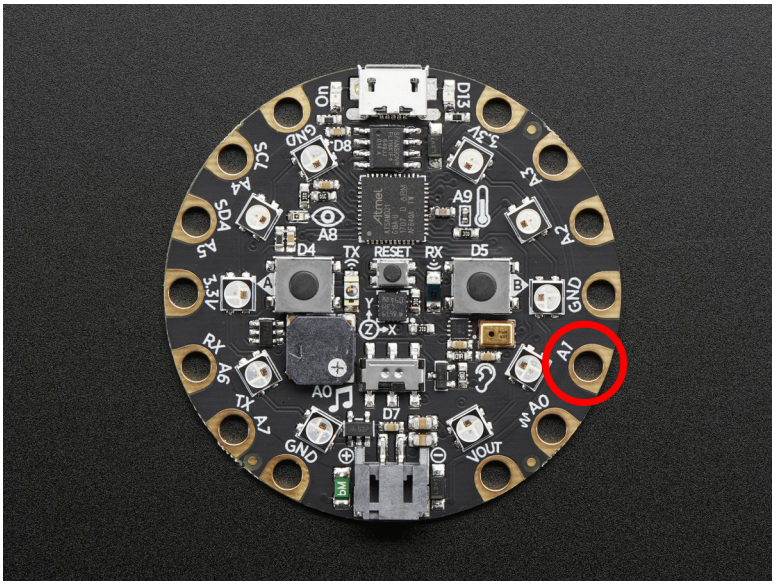


Converting this to Fahrenheit is easy!

To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp
import time

while True:
    temperature_c = cp.temperature
    temperature_f = temperature_c * 1.8 + 32
    print("Temperature celsius:", temperature_c)
    print("Temperature fahrenheit:", temperature_f)
    time.sleep(1)
```

touch_A1
Detect touch on capacitive touch pad A1.

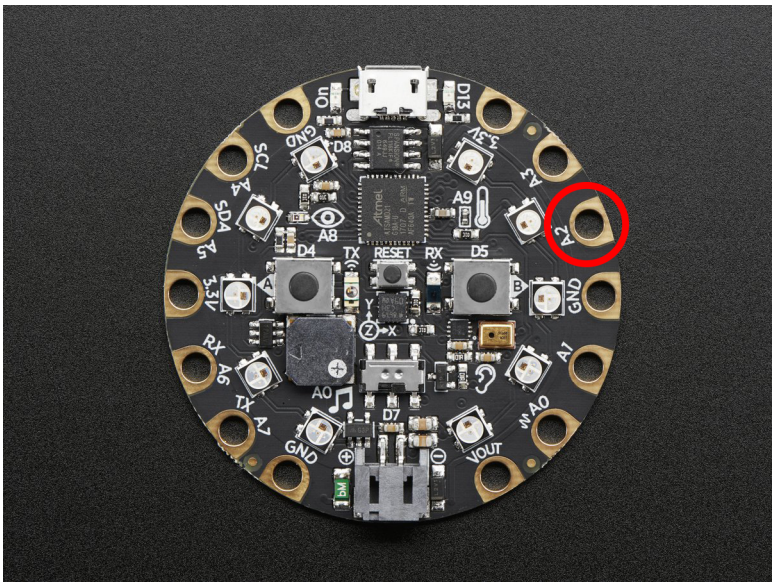


To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    if cp.touch_A1:
        print('Touched pad A1')
```

touch_A2

Detect touch on capacitive touch pad A2.

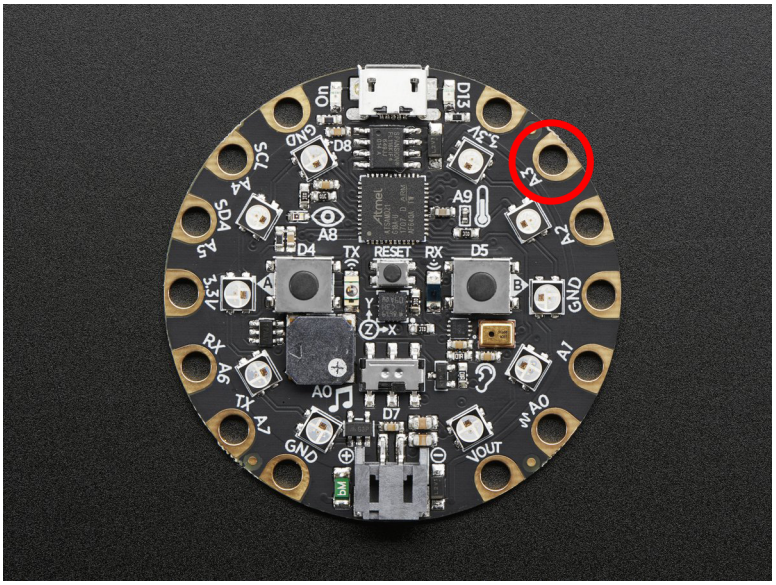


To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    if cp.touch_A2:
        print('Touched pad A2')
```

touch_A3

Detect touch on capacitive touch pad A3.

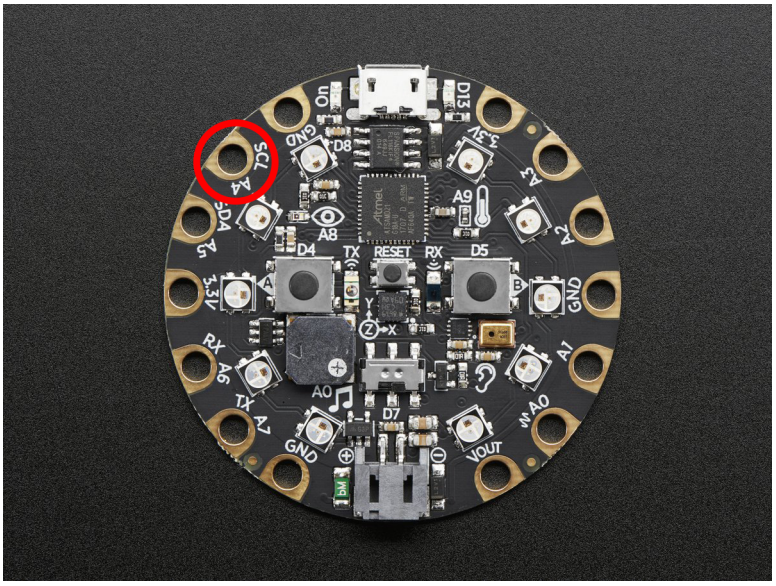


To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    if cp.touch_A3:
        print('Touched pad A3')
```

touch_A4

Detect touch on capacitive touch pad A4.



To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp
```

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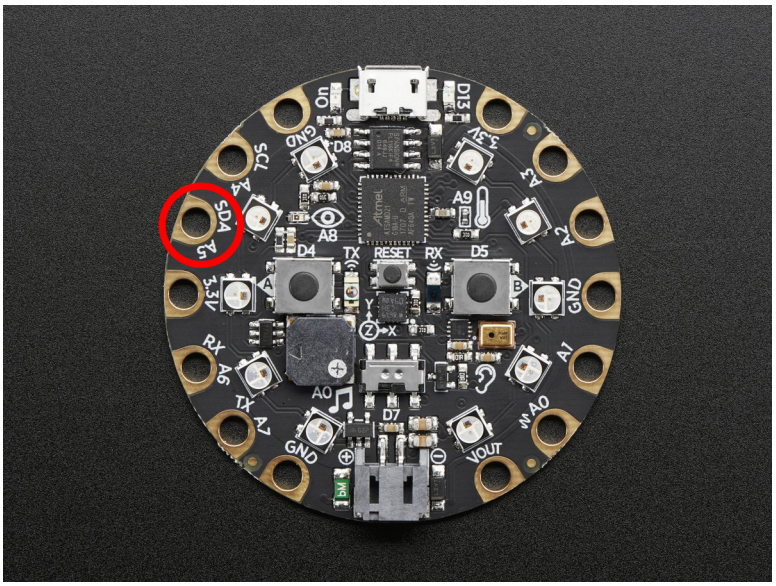
```
while True:
    if cp.touch_A4:
        print('Touched pad A4')
```

touch_A5

Detect touch on capacitive touch pad A5.



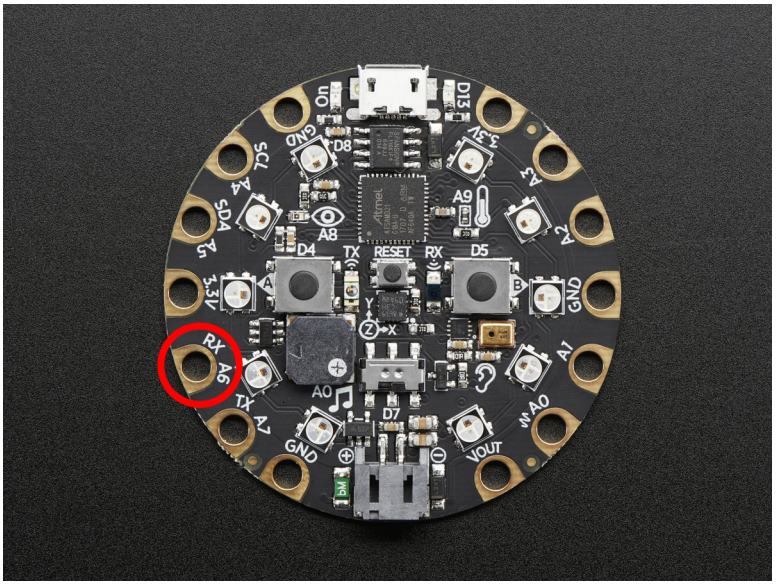
To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    if cp.touch_A5:
        print('Touched pad A5')
```

touch_A6

Detect touch on capacitive touch pad A6.



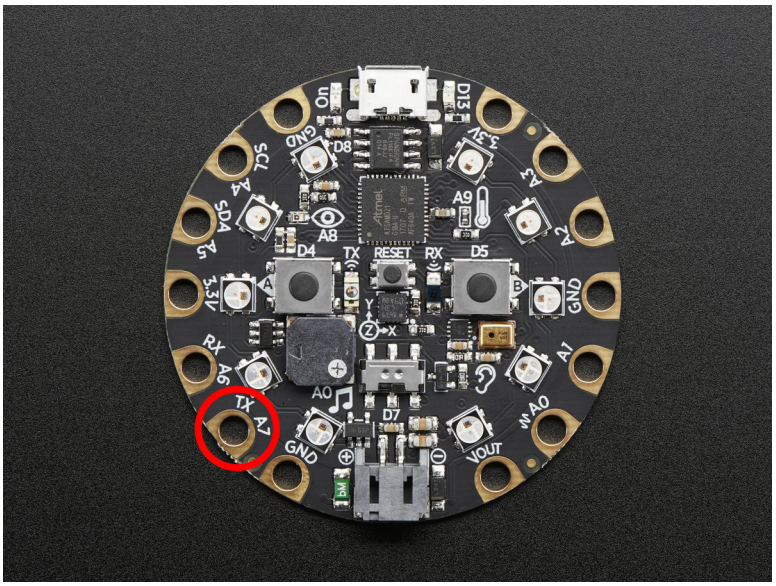
To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    if cp.touch_A6:
        print('Touched pad A6'
```

touch_TX

Detect touch on capacitive touch pad TX (also known as A7 on the Circuit Playground Express) Note: can be called as `touch_A7` on Circuit Playground Express.



To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
```

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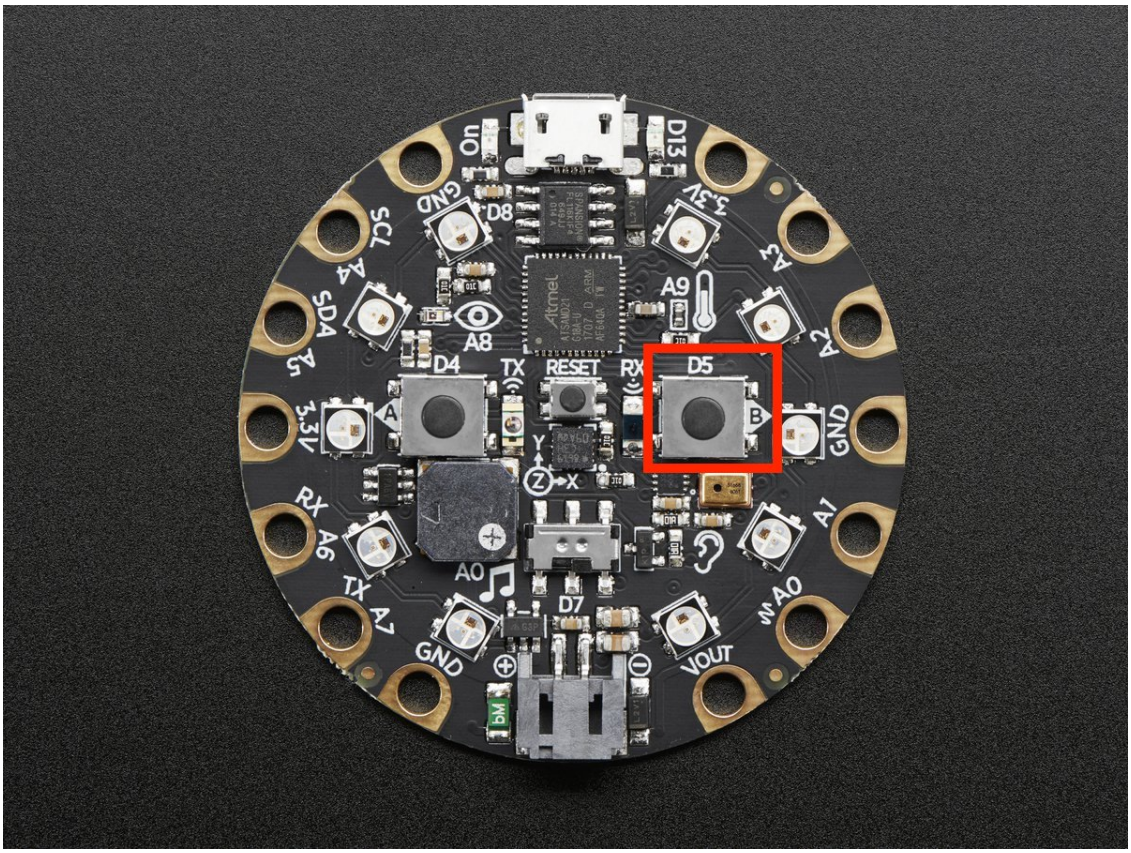
```
    if cp.touch_A7:
        print('Touched pad A7')
```

were_pressed
Returns a set of the buttons that have been pressed



To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    print(cp.were_pressed)
```

class adafruit_circuitplayground.circuit_playground_base.**KeyStates**(*scanner*)
Convert `keypad.Event` information from the given `keypad` scanner into key-pressed state.

Parameters **scanner** – a `keypad` scanner, such as `keypad.Keys`

pressed(*key_number*)
True if key is currently pressed, as of the last *`update()`*.

update()
Update key information based on pending scanner events.

was_pressed(*key_number*)
True if key was down at any time since the last *`update()`*, even if it was later released.

class adafruit_circuitplayground.circuit_playground_base.**Photocell**(*pin*)
Simple driver for analog photocell on the Circuit Playground Express and Bluefruit.

light
Light level.

6.3 adafruit_circuitplayground.bluefruit

CircuitPython helper for Circuit Playground Bluefruit.

- Author(s): Kattni Rembor

6.3.1 Implementation Notes

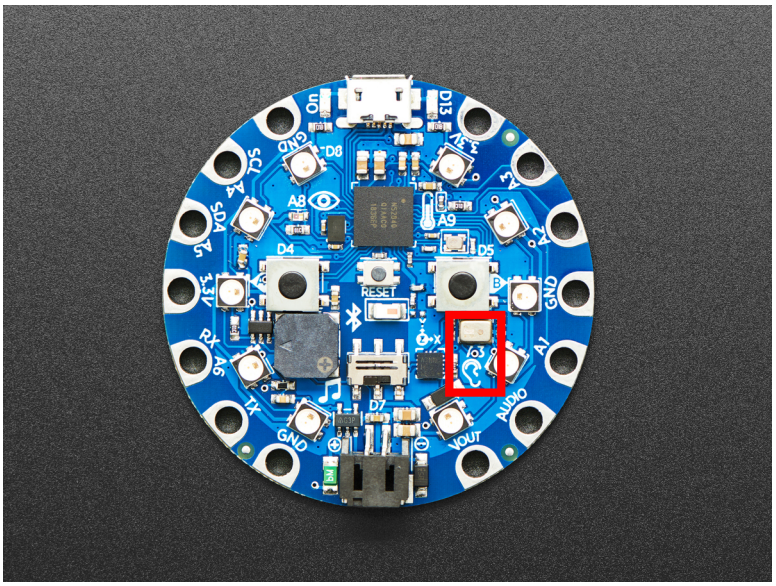
Hardware:

- Circuit Playground Bluefruit

class adafruit_circuitplayground.bluefruit.**Bluefruit**
Represents a single CircuitPlayground Bluefruit.

loud_sound(*sound_threshold=200*)
Utilise a loud sound as an input.

Parameters **sound_threshold** (*int*) – Threshold sound level must exceed to return true (Default: 200)



This example turns the LEDs red each time you make a loud sound. Try clapping or blowing onto the microphone to trigger it.

```
from adafruit_circuitplayground.bluefruit import cpb

while True:
    if cpb.loud_sound():
        cpb.pixels.fill((50, 0, 0))
    else:
        cpb.pixels.fill(0)
```

You may find that the code is not responding how you would like. If this is the case, you can change the loud sound threshold to make it more or less responsive. Setting it to a higher number means it will take a louder sound to trigger. Setting it to a lower number will take a quieter sound to trigger. The following example shows the threshold being set to a higher number than the default.

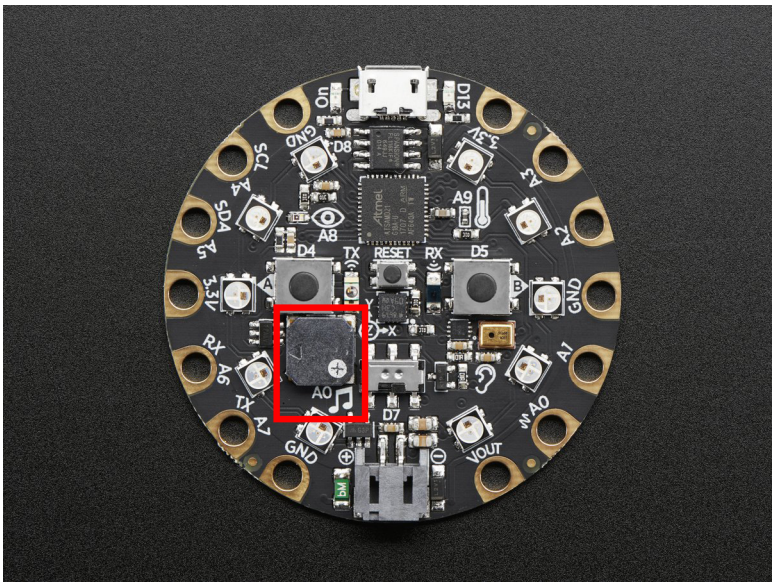
```
from adafruit_circuitplayground.bluefruit import cpb

while True:
    if cpb.loud_sound(sound_threshold=300):
        cpb.pixels.fill((50, 0, 0))
    else:
        cpb.pixels.fill(0)
```

play_mp3 (*file_name*)

Play a .mp3 file using the onboard speaker.

Parameters **file_name** – The name of your .mp3 file in quotation marks including .mp3



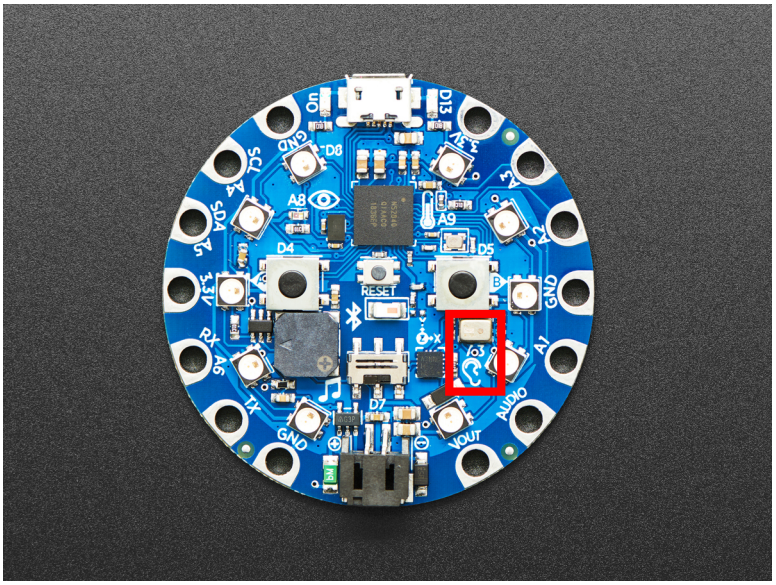
To use with the Circuit Playground Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    if cp.button_a:
        cp.play_mp3("laugh.mp3")
    elif cp.button_b:
        cp.play_mp3("rimshot.mp3")
```

sound_level

Obtain the sound level from the microphone (sound sensor).



This example prints the sound levels. Try clapping or blowing on the microphone to see the levels change.

```
from adafruit_circuitplayground.bluefruit import cpb

while True:
    print(cpb.sound_level)
```

adafruit_circuitplayground.bluefruit.**cpb = <adafruit_circuitplayground.bluefruit.Bluefruit**
Object that is automatically created on import.

To use, simply import it from the module:

```
from adafruit_circuitplayground.bluefruit import cpb
```

6.4 adafruit_circuitplayground.express

CircuitPython helper for Circuit Playground Express.

Hardware:

- Circuit Playground Express
- Author(s): Kattni Rembor, Scott Shawcroft

class adafruit_circuitplayground.express.**Express**
Represents a single CircuitPlayground Express. Do not use more than one at a time.

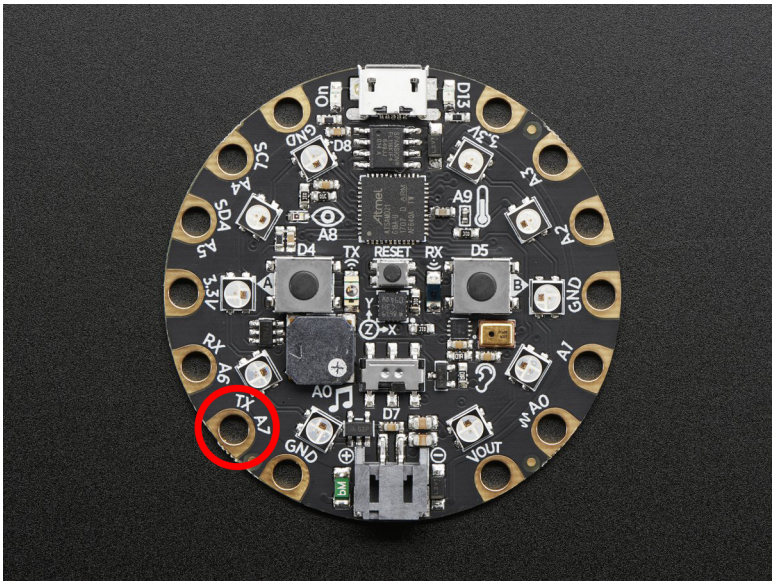
loud_sound
This feature is not supported on Circuit Playground Express.

play_mp3
This feature is not supported on Circuit Playground Express.

sound_level
This feature is not supported on Circuit Playground Express.

touch_A7

Detect touch on capacitive touch pad TX (also known as A7 on the Circuit Playground Express) Note: can be called as `touch_A7` on Circuit Playground Express.



To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

while True:
    if cp.touch_A7:
        print('Touched pad A7')
```

adafruit_circuitplayground.express.**cpx = <adafruit_circuitplayground.express.Express object**

Object that is automatically created on import.

To use, simply import it from the module:

```
from adafruit_circuitplayground.express import cpx
```

CHAPTER 7

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