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# **Adafruit Circuit Playground Library Documentation**

***Release 1.0***

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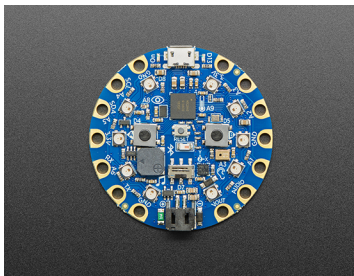
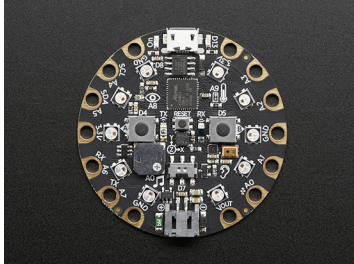
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This high level library provides objects that represent Circuit Playground Express and Bluefruit hardware.





# CHAPTER 1

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## Installation

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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

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### Usage Example

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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

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### Circuit Playground Library Details

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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

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### Contributing

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Contributions are welcome! Please read our [Code of Conduct](#) before contributing to help this project stay welcoming.



## CHAPTER 5

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### Documentation

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For information on building library documentation, please check out [this guide](#).



### 6.1 Simple test

Ensure your device works with this simple test.

Listing 1: examples/circuitplayground\_acceleration.py

```
1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """
5  This example uses the accelerometer on the Circuit Playground. It prints the values.
6  ↳ Try moving
7  the board to see the values change. If you're using Mu, open the plotter to see the
8  ↳ values plotted.
9  """
10
11 import time
12 from adafruit_circuitplayground import cp
13
14 while True:
15     x, y, z = cp.acceleration
16     print((x, y, z))
17
18     time.sleep(0.1)
```

Listing 2: examples/circuitplayground\_pixels\_simpletest.py

```
1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """This example lights up the NeoPixels with a rainbow swirl."""
5  import time
6  from adafruit_circuitplayground import cp
7
```

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```

8
9 def wheel(pos):
10     # Input a value 0 to 255 to get a color value.
11     # The colours are a transition r - g - b - back to r.
12     if (pos < 0) or (pos > 255):
13         return (0, 0, 0)
14     if pos < 85:
15         return (int(pos * 3), int(255 - (pos * 3)), 0)
16     if pos < 170:
17         pos -= 85
18         return (int(255 - pos * 3), 0, int(pos * 3))
19     pos -= 170
20     return (0, int(pos * 3), int(255 - pos * 3))
21
22
23 def rainbow_cycle(wait):
24     for j in range(255):
25         for i in range(cp.pixels.n):
26             idx = int((i * 256 / len(cp.pixels)) + j)
27             cp.pixels[i] = wheel(idx & 255)
28             cp.pixels.show()
29             time.sleep(wait)
30
31
32 cp.pixels.auto_write = False
33 cp.pixels.brightness = 0.3
34 while True:
35     rainbow_cycle(0.001) # rainbowcycle with 1ms delay per step

```

Listing 3: examples/circuitplayground\_shake.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example prints to the serial console when the Circuit Playground is shaken."""
5 from adafruit_circuitplayground import cp
6
7 while True:
8     if cp.shake():
9         print("Shake detected!")

```

Listing 4: examples/circuitplayground\_tapdetect\_single\_double.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example shows how you can use single-tap and double-tap together with a delay
5 ↪ between.
6 Single-tap the board twice and then double-tap the board twice to complete the
7 ↪ program."""
8 from adafruit_circuitplayground import cp
9
10 # Set to check for single-taps.
11 cp.detect_taps = 1
12 tap_count = 0

```

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```

12 # We're looking for 2 single-taps before moving on.
13 while tap_count < 2:
14     if cp.tapped:
15         tap_count += 1
16 print("Reached 2 single-taps!")
17
18 # Now switch to checking for double-taps
19 tap_count = 0
20 cp.detect_taps = 2
21
22 # We're looking for 2 double-taps before moving on.
23 while tap_count < 2:
24     if cp.tapped:
25         tap_count += 1
26 print("Reached 2 double-taps!")
27 print("Done.")
28 while True:
29     cp.red_led = True

```

Listing 5: examples/circuitplayground\_tapdetect.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example prints to the serial console when the board is double-tapped."""
5 import time
6 from adafruit_circuitplayground import cp
7
8 # Change to 1 for single-tap detection.
9 cp.detect_taps = 2
10
11 while True:
12     if cp.tapped:
13         print("Tapped!")
14         time.sleep(0.05)

```

Listing 6: examples/circuitplayground\_tone.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example plays a different tone for each button, while the button is pressed."""
5 ↪
6 from adafruit_circuitplayground import cp
7
8 while True:
9     if cp.button_a:
10         cp.start_tone(262)
11     elif cp.button_b:
12         cp.start_tone(294)
13     else:
14         cp.stop_tone()

```

Listing 7: examples/circuitplayground\_touched.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """This example prints to the serial console when you touch the capacitive touch pads.
   ↪ """
5  from adafruit_circuitplayground import cp
6
7  while True:
8      if cp.touch_A1:
9          print("Touched pad A1")
10         if cp.touch_A2:
11             print("Touched pad A2")
12         if cp.touch_A3:
13             print("Touched pad A3")
14         if cp.touch_A4:
15             print("Touched pad A4")
16         if cp.touch_A5:
17             print("Touched pad A5")
18         if cp.touch_A6:
19             print("Touched pad A6")
20         if cp.touch_TX:
21             print("Touched pad TX")

```

Listing 8: examples/circuitplayground\_acceleration\_neopixels.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """If the switch is to the right, it will appear that nothing is happening. Move the_
   ↪ switch to the
5  left to see the NeoPixels light up in colors related to the accelerometer! The_
   ↪ Circuit Playground
6  has an accelerometer in the center that returns (x, y, z) acceleration values. This_
   ↪ program uses
7  those values to light up the NeoPixels based on those acceleration values."""
8  from adafruit_circuitplayground import cp
9
10 # Main loop gets x, y and z axis acceleration, prints the values, and turns on
11 # red, green and blue, at levels related to the x, y and z values.
12 while True:
13     if not cp.switch:
14         # If the switch is to the right, it returns False!
15         print("Slide switch off!")
16         cp.pixels.fill((0, 0, 0))
17         continue
18     R = 0
19     G = 0
20     B = 0
21     x, y, z = cp.acceleration
22     print((x, y, z))
23     cp.pixels.fill(((R + abs(int(x))), (G + abs(int(y))), (B + abs(int(z)))))

```



Listing 9: examples/circuitplayground\_button\_a.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example turns on the little red LED when button A is pressed."""
5 from adafruit_circuitplayground import cp
6
7 while True:
8     if cp.button_a:
9         print("Button A pressed!")
10        cp.red_led = True

```

Listing 10: examples/circuitplayground\_button\_b.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example turns the little red LED on only while button B is currently being_
↳pressed."""
5 from adafruit_circuitplayground import cp
6
7 # This code is written to be readable versus being Pylint compliant.
8 # pylint: disable=simplifiable-if-statement
9
10 while True:
11     if cp.button_b:
12         cp.red_led = True
13     else:
14         cp.red_led = False
15
16 # Can also be written as:
17 #     cp.red_led = cp.button_b

```

Listing 11: examples/circuitplayground\_buttons\_1\_neopixel.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example lights up the third NeoPixel while button A is being pressed, and_
↳lights up the
5 eighth NeoPixel while button B is being pressed."""
6 from adafruit_circuitplayground import cp
7
8 cp.pixels.brightness = 0.3
9 cp.pixels.fill((0, 0, 0)) # Turn off the NeoPixels if they're on!
10
11 while True:
12     if cp.button_a:
13         cp.pixels[2] = (0, 255, 0)
14     else:
15         cp.pixels[2] = (0, 0, 0)
16
17     if cp.button_b:
18         cp.pixels[7] = (0, 0, 255)
19     else:

```

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

Listing 12: examples/circuitplayground\_buttons\_neopixels.py

```
1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example lights up half the NeoPixels red while button A is being pressed, and
5 ↪half the
6 NeoPixels green while button B is being pressed."""
7 from adafruit_circuitplayground import cp
8
9 cp.pixels.brightness = 0.3
10 cp.pixels.fill((0, 0, 0)) # Turn off the NeoPixels if they're on!
11
12 while True:
13     if cp.button_a:
14         cp.pixels[0:5] = [(255, 0, 0)] * 5
15     else:
16         cp.pixels[0:5] = [(0, 0, 0)] * 5
17
18     if cp.button_b:
19         cp.pixels[5:10] = [(0, 255, 0)] * 5
20     else:
21         cp.pixels[5:10] = [(0, 0, 0)] * 5
```

Listing 13: examples/circuitplayground\_ir\_receive.py

```
1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """THIS EXAMPLE REQUIRES A SEPARATE LIBRARY BE LOADED ONTO YOUR CIRCUITPY DRIVE.
5 This example requires the adafruit_irremote.mpy library.
6
7 THIS EXAMPLE WORKS WITH CIRCUIT PLAYGROUND EXPRESS ONLY.
8
9 This example uses the IR receiver found near the center of the board. Works with
10 ↪another Circuit
11 Playground Express running the circuitplayground_ir_transmit.py example. The
12 ↪NeoPixels will light
13 up when the buttons on the TRANSMITTING Circuit Playground Express are pressed!"""
14 import pulseio
15 import board
16 import adafruit_irremote
17 from adafruit_circuitplayground import cp
18
19 # Create a 'pulseio' input, to listen to infrared signals on the IR receiver
20 try:
21     pulsein = pulseio.PulseIn(board.IR_RX, maxlen=120, idle_state=True)
22 except AttributeError as err:
23     raise NotImplementedError(
24         "This example does not work with Circuit Playground Bluefruti!"
25     ) from err
26
27 # Create a decoder that will take pulses and turn them into numbers
28 decoder = adafruit_irremote.GenericDecode()
```

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```

27
28 while True:
29     cp.red_led = True
30     pulses = decoder.read_pulses(pulsein)
31     try:
32         # Attempt to convert received pulses into numbers
33         received_code = decoder.decode_bits(pulses)
34     except adafruit_irremote.IRNECRepeatException:
35         # We got an unusual short code, probably a 'repeat' signal
36         continue
37     except adafruit_irremote.IRDecodeException:
38         # Something got distorted
39         continue
40
41     print("Infrared code received: ", received_code)
42     if received_code == [66, 84, 78, 65]:
43         print("Button A signal")
44         cp.pixels.fill((100, 0, 155))
45     if received_code == [66, 84, 78, 64]:
46         print("Button B Signal")
47         cp.pixels.fill((210, 45, 0))

```

Listing 14: examples/circuitplayground\_ir\_transmit.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """THIS EXAMPLE REQUIRES A SEPARATE LIBRARY BE LOADED ONTO YOUR CIRCUITPY DRIVE.
5  This example requires the adafruit_irremote.mpy library.
6
7  THIS EXAMPLE WORKS WITH CIRCUIT PLAYGROUND EXPRESS ONLY.
8
9  This example uses the IR transmitter found near the center of the board. Works with_
10 ↪ another Circuit
11 Playground Express running the circuitplayground_ir_receive.py example. Press the_
12 ↪ buttons to light
13 up the NeoPixels on the RECEIVING Circuit Playground Express!"""
14 import time
15 import pulseio
16 import pwmio
17 import board
18 import adafruit_irremote
19 from adafruit_circuitplayground import cp
20
21 # Create a 'pwmio' output, to send infrared signals from the IR transmitter
22 try:
23     pwm = pwmio.PWMOut(board.IR_TX, frequency=38000, duty_cycle=2 ** 15)
24 except AttributeError as err:
25     raise NotImplementedError(
26         "This example does not work with Circuit Playground Bluefruit!"
27     ) from err
28
29 pulseout = pulseio.PulseOut(pwm) # pylint: disable=no-member
30 # Create an encoder that will take numbers and turn them into NEC IR pulses
31 encoder = adafruit_irremote.GenericTransmit(
32     header=[9500, 4500], one=[550, 550], zero=[550, 1700], trail=0

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```

31 )
32
33 while True:
34     if cp.button_a:
35         print("Button A pressed! \n")
36         cp.red_led = True
37         encoder.transmit(pulseout, [66, 84, 78, 65])
38         cp.red_led = False
39         # wait so the receiver can get the full message
40         time.sleep(0.2)
41     if cp.button_b:
42         print("Button B pressed! \n")
43         cp.red_led = True
44         encoder.transmit(pulseout, [66, 84, 78, 64])
45         cp.red_led = False
46         time.sleep(0.2)

```

Listing 15: examples/circuitplayground\_light\_neopixels.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """
5  This example uses the light sensor on the Circuit Playground, located next to the
6  ↳ picture of the
7  eye on the board. Once you have the library loaded, try shining a flashlight on your
8  ↳ Circuit
9  Playground to watch the number of NeoPixels lit up increase, or try covering up the
10 ↳ light sensor
11 to watch the number decrease.
12 """
13
14 import time
15 from adafruit_circuitplayground import cp
16
17 cp.pixels.auto_write = False
18 cp.pixels.brightness = 0.3
19
20 def scale_range(value):
21     """Scale a value from 0-320 (light range) to 0-9 (NeoPixel range).
22     Allows remapping light value to pixel position."""
23     return round(value / 320 * 9)
24
25 while True:
26     peak = scale_range(cp.light)
27     print(cp.light)
28     print(int(peak))
29
30     for i in range(10):
31         if i <= peak:
32             cp.pixels[i] = (0, 255, 255)
33         else:
34             cp.pixels[i] = (0, 0, 0)
35     cp.pixels.show()
36     time.sleep(0.05)

```

Listing 16: examples/circuitplayground\_light.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example uses the light sensor on your Circuit Playground, located next to the
5 ↳ picture of
6 the eye. Try shining a flashlight on your Circuit Playground, or covering the light
7 ↳ sensor with
8 your finger to see the values increase and decrease."""
9
10 import time
11 from adafruit_circuitplayground import cp
12
13 while True:
14     print("Light:", cp.light)
15     time.sleep(0.2)

```

Listing 17: examples/circuitplayground\_neopixel\_0\_1.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example lights up the first and second NeoPixel, red and blue respectively."""
5 from adafruit_circuitplayground import cp
6
7 cp.pixels.brightness = 0.3
8
9 while True:
10     cp.pixels[0] = (255, 0, 0)
11     cp.pixels[1] = (0, 0, 255)

```

Listing 18: examples/circuitplayground\_light\_plotter.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """If you're using Mu, this example will plot the light levels from the light sensor
5 ↳ (located next
6 to the eye) on your Circuit Playground. Try shining a flashlight on your Circuit
7 ↳ Playground, or
8 covering the light sensor to see the plot increase and decrease."""
9
10 import time
11 from adafruit_circuitplayground import cp
12
13 while True:
14     print("Light:", cp.light)
15     print((cp.light,))
16     time.sleep(0.1)

```

Listing 19: examples/circuitplayground\_play\_file\_buttons.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """THIS EXAMPLE REQUIRES A WAV FILE FROM THE examples FOLDER IN THE
5 Adafruit_CircuitPython_CircuitPlayground REPO found at:

```

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```

6  https://github.com/adafruit/Adafruit_CircuitPython_CircuitPlayground/tree/master/
   ↪examples
7
8  Copy the "dip.wav" and "rise.wav" files to your CIRCUITPY drive.
9
10 Once the files are copied, this example plays a different wav file for each button_
   ↪pressed!"""
11 from adafruit_circuitplayground import cp
12
13 while True:
14     if cp.button_a:
15         cp.play_file("dip.wav")
16     if cp.button_b:
17         cp.play_file("rise.wav")

```

Listing 20: examples/circuitplayground\_play\_file.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """THIS EXAMPLE REQUIRES A WAV FILE FROM THE examples FOLDER IN THE
5  Adafruit_CircuitPython_CircuitPlayground REPO found at:
6  https://github.com/adafruit/Adafruit_CircuitPython_CircuitPlayground/tree/master/
   ↪examples
7
8  Copy the "dip.wav" file to your CIRCUITPY drive.
9
10 Once the file is copied, this example plays a wav file!"""
11 from adafruit_circuitplayground import cp
12
13 cp.play_file("dip.wav")

```

Listing 21: examples/circuitplayground\_play\_tone\_buttons.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """This example plays a different tone for a duration of 1 second for each button_
   ↪pressed."""
5  from adafruit_circuitplayground import cp
6
7  while True:
8      if cp.button_a:
9          cp.play_tone(262, 1)
10     if cp.button_b:
11         cp.play_tone(294, 1)

```

Listing 22: examples/circuitplayground\_play\_tone.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """This example plays two tones for 1 second each. Note that the tones are not in a_
   ↪loop - this is
5  to prevent them from playing indefinitely!"""

```

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```

6 from adafruit_circuitplayground import cp
7
8 cp.play_tone(262, 1)
9 cp.play_tone(294, 1)

```

Listing 23: examples/circuitplayground\_red\_led\_blinky.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This is the "Hello, world!" of CircuitPython: Blinky! This example blinks the
5 ↪ little red LED on
6 and off!"""
7 import time
8 from adafruit_circuitplayground import cp
9
10 while True:
11     cp.red_led = True
12     time.sleep(0.5)
13     cp.red_led = False
14     time.sleep(0.5)

```

Listing 24: examples/circuitplayground\_red\_led\_blinky\_short.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This is the "Hello, world!" of CircuitPython: Blinky! This example blinks the
5 ↪ little red LED on
6 and off! It's a shorter version of the other Blinky example."""
7 import time
8 from adafruit_circuitplayground import cp
9
10 while True:
11     cp.red_led = not cp.red_led
12     time.sleep(0.5)

```

Listing 25: examples/circuitplayground\_red\_led.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example turns on the little red LED."""
5 from adafruit_circuitplayground import cp
6
7 while True:
8     cp.red_led = True

```

Listing 26: examples/circuitplayground\_slide\_switch\_red\_led.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example uses the slide switch to control the little red LED."""
5 from adafruit_circuitplayground import cp

```

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```

6
7 # This code is written to be readable versus being Pylint compliant.
8 # pylint: disable=simplifiable-if-statement
9
10 while True:
11     if cp.switch:
12         cp.red_led = True
13     else:
14         cp.red_led = False

```

Listing 27: examples/circuitplayground\_slide\_switch\_red\_led\_short.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example uses the slide switch to control the little red LED. When the switch
5 ↪ is to the right it returns False, and when it's to the left, it returns True."""
6 from adafruit_circuitplayground import cp
7
8 while True:
9     cp.red_led = cp.switch

```

Listing 28: examples/circuitplayground\_slide\_switch.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example prints the status of the slide switch. Try moving the switch back and
5 ↪ forth to see what's printed to the serial console!"""
6 import time
7 from adafruit_circuitplayground import cp
8
9 while True:
10     print("Slide switch:", cp.switch)
11     time.sleep(0.1)

```

Listing 29: examples/circuitplayground\_sound\_meter.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 """This example uses the sound sensor, located next to the picture of the ear on your
5 ↪ board, to light up the NeoPixels as a sound meter. Try talking to your Circuit Playground or
6 ↪ clapping, etc, to see the NeoPixels light up!"""
7 import array
8 import math
9 import board
10 import audiobusio
11 from adafruit_circuitplayground import cp
12
13

```

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```

14 def constrain(value, floor, ceiling):
15     return max(floor, min(value, ceiling))
16
17
18 def log_scale(input_value, input_min, input_max, output_min, output_max):
19     normalized_input_value = (input_value - input_min) / (input_max - input_min)
20     return output_min + math.pow(normalized_input_value, 0.630957) * (
21         output_max - output_min
22     )
23
24
25 def normalized_rms(values):
26     minbuf = int(sum(values) / len(values))
27     return math.sqrt(
28         sum(float(sample - minbuf) * (sample - minbuf) for sample in values)
29         / len(values)
30     )
31
32
33 mic = audiobusio.PDMIn(
34     board.MICROPHONE_CLOCK, board.MICROPHONE_DATA, sample_rate=16000, bit_depth=16
35 )
36
37 samples = array.array("H", [0] * 160)
38 mic.record(samples, len(samples))
39 input_floor = normalized_rms(samples) + 10
40
41 # Lower number means more sensitive - more LEDs will light up with less sound.
42 sensitivity = 500
43 input_ceiling = input_floor + sensitivity
44
45 peak = 0
46 while True:
47     mic.record(samples, len(samples))
48     magnitude = normalized_rms(samples)
49     print((magnitude,))
50
51     c = log_scale(
52         constrain(magnitude, input_floor, input_ceiling),
53         input_floor,
54         input_ceiling,
55         0,
56         10,
57     )
58
59     cp.pixels.fill((0, 0, 0))
60     for i in range(10):
61         if i < c:
62             cp.pixels[i] = (i * (255 // 10), 50, 0)
63         if c >= peak:
64             peak = min(c, 10 - 1)
65         elif peak > 0:
66             peak = peak - 1
67         if peak > 0:
68             cp.pixels[int(peak)] = (80, 0, 255)
69     cp.pixels.show()

```

Listing 30: examples/circuitplayground\_tap\_red\_led.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """This example turns on the little red LED and prints to the serial console when you
   ↳double-tap
5  the Circuit Playground!"""
6  import time
7  from adafruit_circuitplayground import cp
8
9  # Change to 1 for detecting a single-tap!
10 cp.detect_taps = 2
11
12 while True:
13     if cp.tapped:
14         print("Tapped!")
15         cp.red_led = True
16         time.sleep(0.1)
17     else:
18         cp.red_led = False

```

Listing 31: examples/circuitplayground\_temperature\_neopixels.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """
5  This example use the temperature sensor on the Circuit Playground, located next to
   ↳the picture of
6  the thermometer on the board. Try warming up the board to watch the number of
   ↳NeoPixels lit up
7  increase, or cooling it down to see the number decrease. You can set the min and max
   ↳temperatures
8  to make it more or less sensitive to temperature changes.
9  """
10 import time
11 from adafruit_circuitplayground import cp
12
13 cp.pixels.auto_write = False
14 cp.pixels.brightness = 0.3
15
16 # Set these based on your ambient temperature in Celsius for best results!
17 minimum_temp = 24
18 maximum_temp = 30
19
20
21 def scale_range(value):
22     """Scale a value from the range of minimum_temp to maximum_temp (temperature
   ↳range) to 0-10
23     (the number of NeoPixels). Allows remapping temperature value to pixel position."""
   ↳"
24     return int((value - minimum_temp) / (maximum_temp - minimum_temp) * 10)
25
26
27 while True:
28     peak = scale_range(cp.temperature)

```

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```

29     print(cp.temperature)
30     print(int(peak))
31
32     for i in range(10):
33         if i <= peak:
34             cp.pixels[i] = (0, 255, 255)
35         else:
36             cp.pixels[i] = (0, 0, 0)
37     cp.pixels.show()
38     time.sleep(0.05)

```

Listing 32: examples/circuitplayground\_temperature\_plotter.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """If you're using Mu, this example will plot the temperature in C and F on the_
5  ↪plotter! Click
6  "Plotter" to open it, and place your finger over the sensor to see the numbers change.
7  ↪ The
8  sensor is located next to the picture of the thermometer on the CPX."""
9
10 import time
11 from adafruit_circuitplayground import cp
12
13 while True:
14     print("Temperature C:", cp.temperature)
15     print("Temperature F:", cp.temperature * 1.8 + 32)
16     print((cp.temperature, cp.temperature * 1.8 + 32))
17     time.sleep(0.1)

```

Listing 33: examples/circuitplayground\_temperature.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """This example uses the temperature sensor on the Circuit Playground, located next_
5  ↪to the image of
6  a thermometer on the board. It prints the temperature in both C and F to the serial_
7  ↪console. Try
8  putting your finger over the sensor to see the numbers change!"""
9
10 import time
11 from adafruit_circuitplayground import cp
12
13 while True:
14     print("Temperature C:", cp.temperature)
15     print("Temperature F:", cp.temperature * 1.8 + 32)
16     time.sleep(1)

```

Listing 34: examples/circuitplayground\_touch\_pixel\_fill\_rainbow.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """This example uses the capacitive touch pads on the Circuit Playground. They are_
5  ↪located around

```

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```

5  the outer edge of the board and are labeled A1-A6 and TX. (A0 is not a touch pad.)_
   ↳This example
6  lights up all the NeoPixels a different color of the rainbow for each pad touched!"""
7  import time
8  from adafruit_circuitplayground import cp
9
10 cp.pixels.brightness = 0.3
11
12 while True:
13     if cp.touch_A1:
14         print("Touched A1!")
15         cp.pixels.fill((255, 0, 0))
16     if cp.touch_A2:
17         print("Touched A2!")
18         cp.pixels.fill((210, 45, 0))
19     if cp.touch_A3:
20         print("Touched A3!")
21         cp.pixels.fill((155, 100, 0))
22     if cp.touch_A4:
23         print("Touched A4!")
24         cp.pixels.fill((0, 255, 0))
25     if cp.touch_A5:
26         print("Touched A5!")
27         cp.pixels.fill((0, 135, 125))
28     if cp.touch_A6:
29         print("Touched A6!")
30         cp.pixels.fill((0, 0, 255))
31     if cp.touch_TX:
32         print("Touched TX!")
33         cp.pixels.fill((100, 0, 155))
34     time.sleep(0.1)

```

Listing 35: examples/circuitplayground\_touch\_pixel\_rainbow.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  """This example uses the capacitive touch pads on the Circuit Playground. They are_
   ↳located around
5  the outer edge of the board and are labeled A1-A6 and TX. (A0 is not a touch pad.)_
   ↳This example
6  lights up the nearest NeoPixel to that pad a different color of the rainbow!"""
7  import time
8  from adafruit_circuitplayground import cp
9
10 cp.pixels.brightness = 0.3
11
12 while True:
13     if cp.touch_A1:
14         print("Touched A1!")
15         cp.pixels[6] = (255, 0, 0)
16     if cp.touch_A2:
17         print("Touched A2!")
18         cp.pixels[8] = (210, 45, 0)
19     if cp.touch_A3:
20         print("Touched A3!")

```

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```

21     cp.pixels[9] = (155, 100, 0)
22     if cp.touch_A4:
23         print("Touched A4!")
24         cp.pixels[0] = (0, 255, 0)
25     if cp.touch_A5:
26         print("Touched A5!")
27         cp.pixels[1] = (0, 135, 125)
28     if cp.touch_A6:
29         print("Touched A6!")
30         cp.pixels[3] = (0, 0, 255)
31     if cp.touch_TX:
32         print("Touched TX!")
33         cp.pixels[4] = (100, 0, 155)
34     time.sleep(0.1)

```

## 6.2 adafruit\_circuitplayground.circuit\_playground\_base

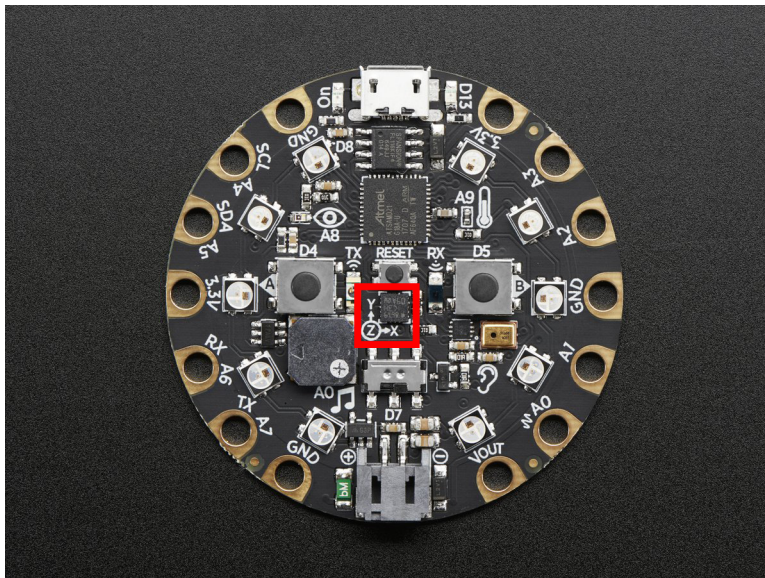
CircuitPython base class for Circuit Playground.

- [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

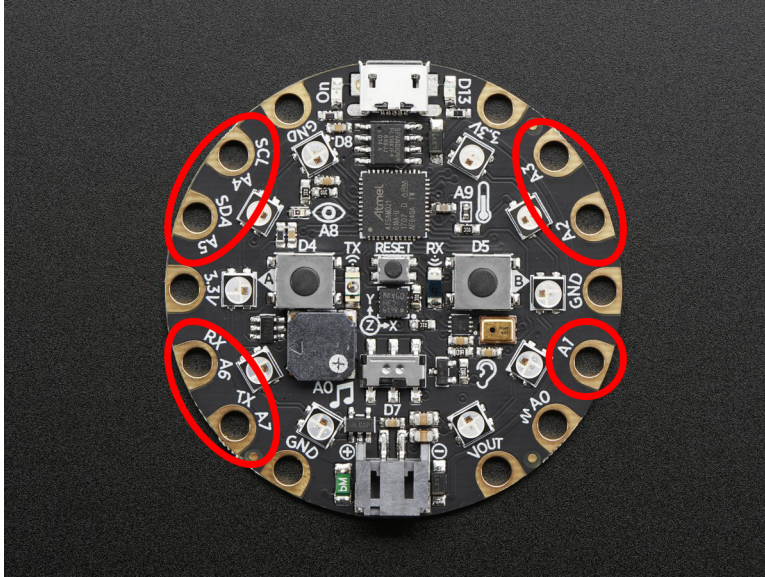
while True:
    x, y, z = cp.acceleration
    print(x, y, z)

```

**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)

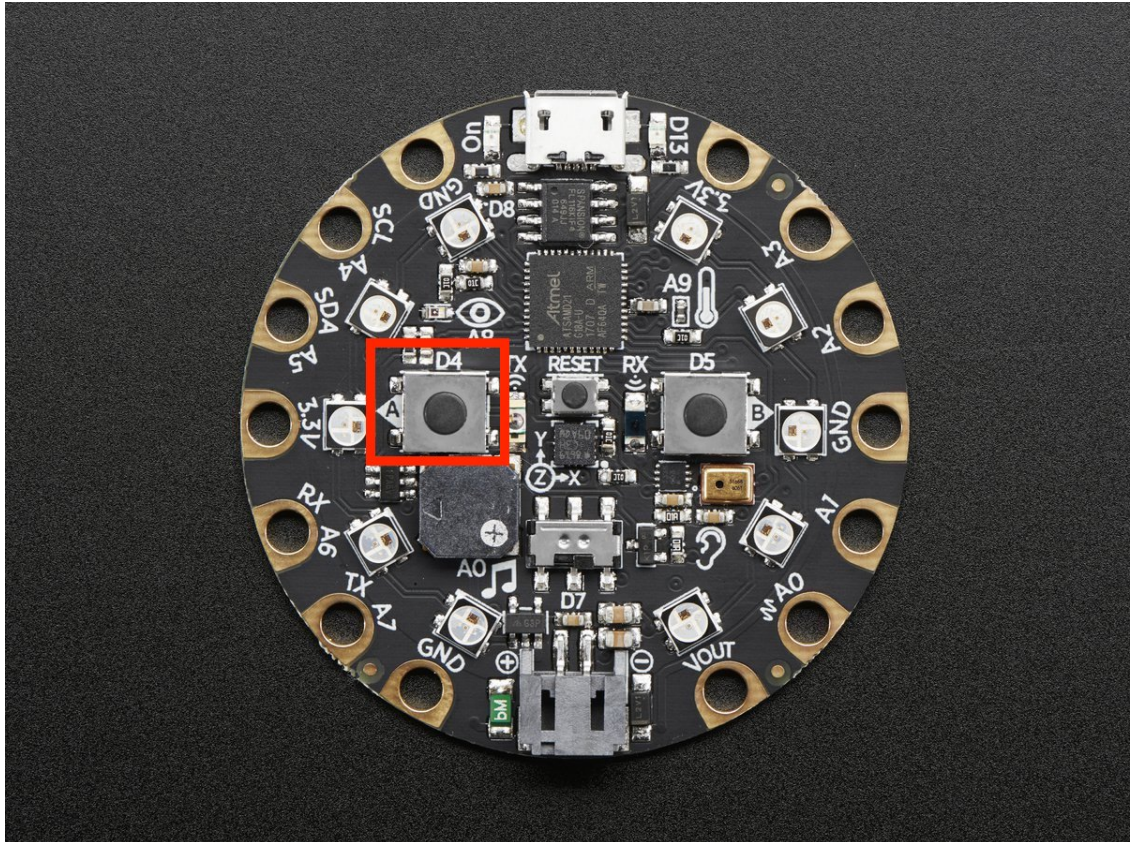
while True:
    if cp.touch_A1:
        print('Touched pad A1')

```

**button\_a**

True when Button A is pressed. False if not.





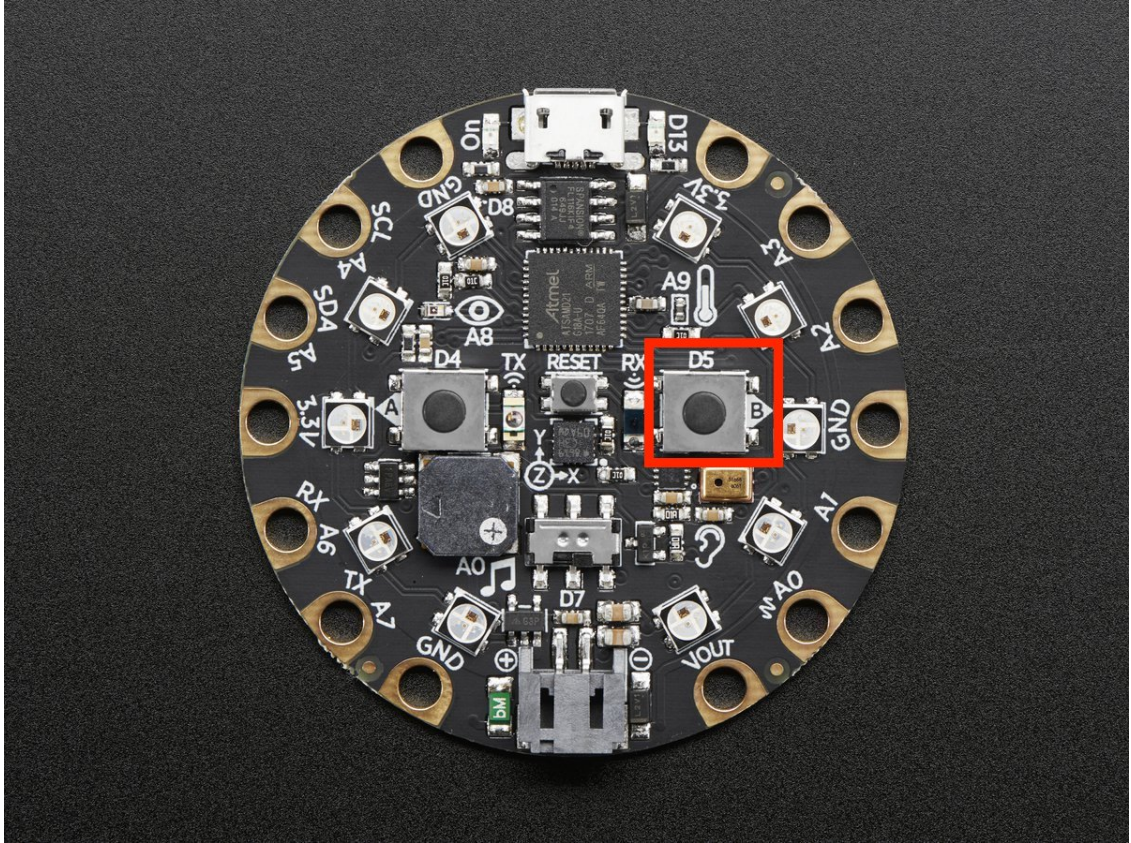
To use with the Circuit Playground Express or Bluefruit:

```
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).

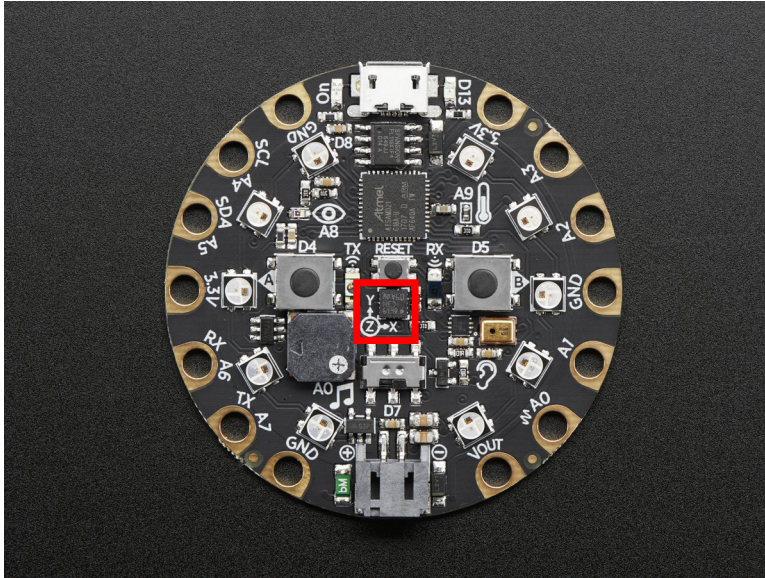
To use with the Circuit Playground Express or Bluefruit:

```
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`.



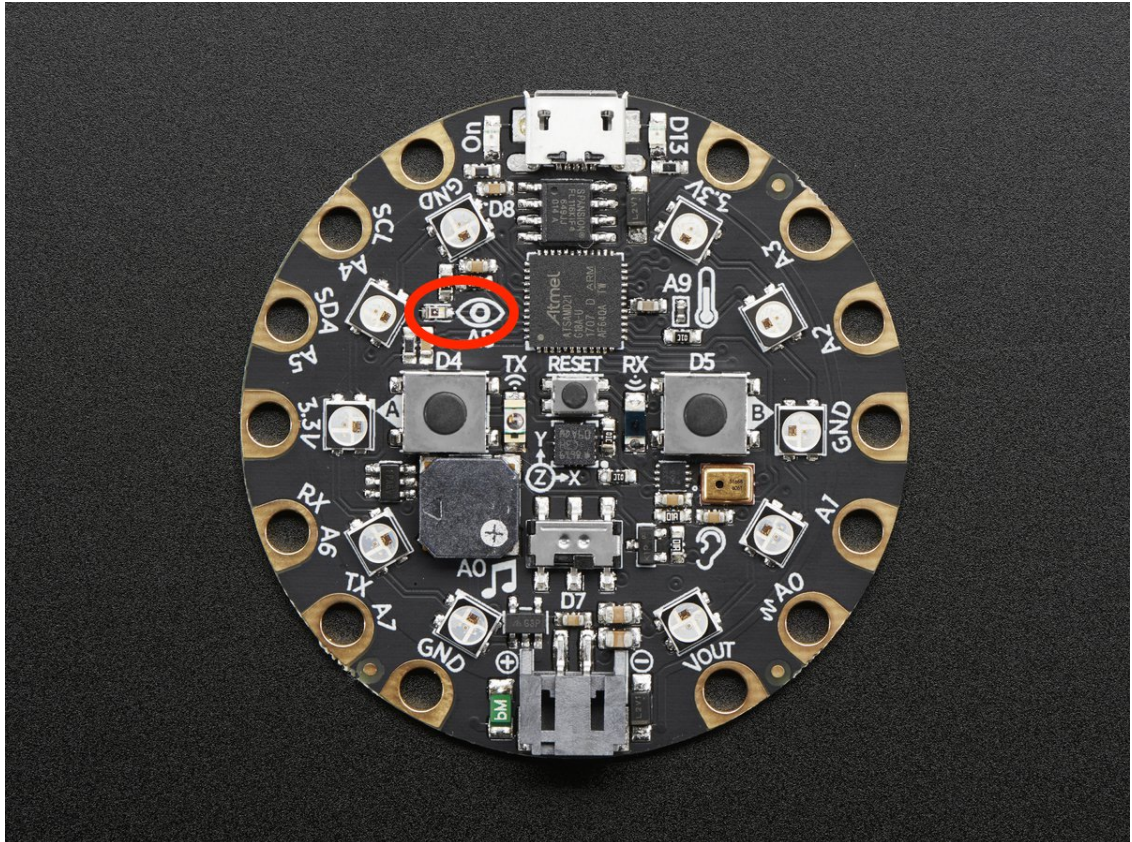
To use with the Circuit Playground Express or Bluefruit:

```
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

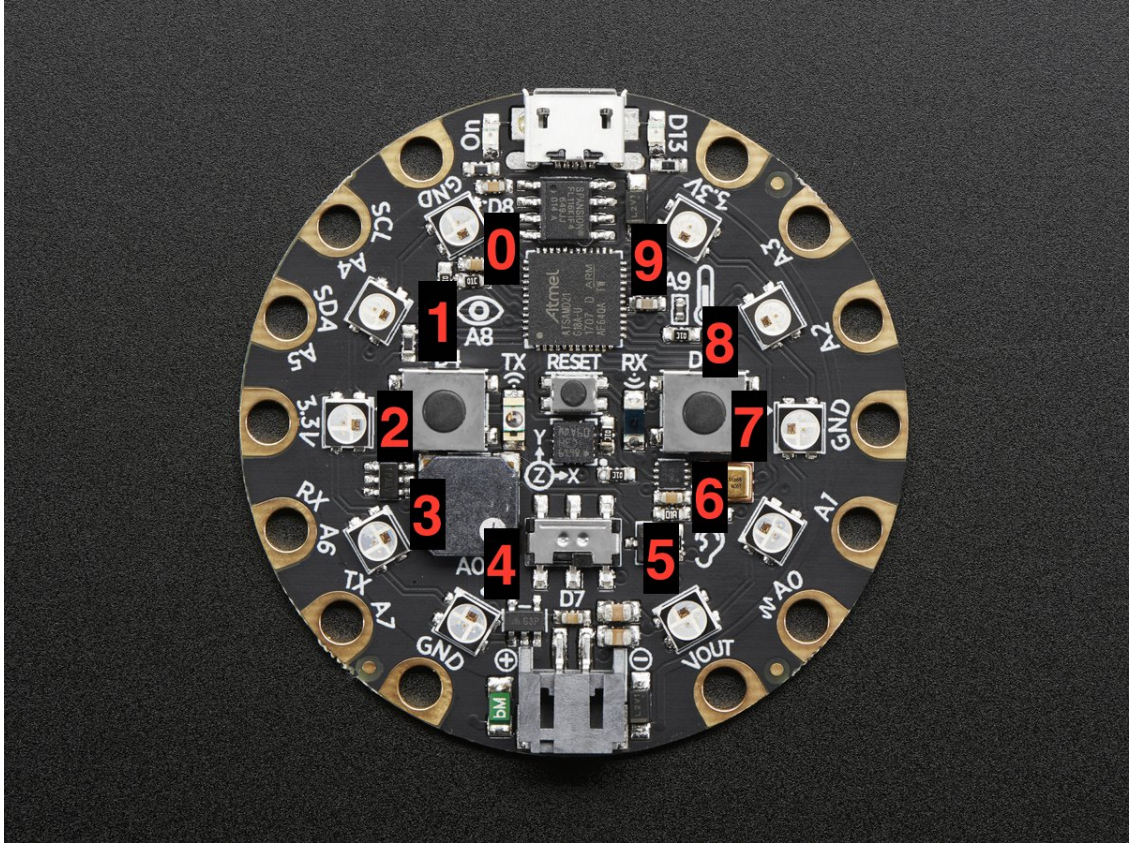
while True:
    print("Light:", cp.light)
    time.sleep(1)
```

### 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:

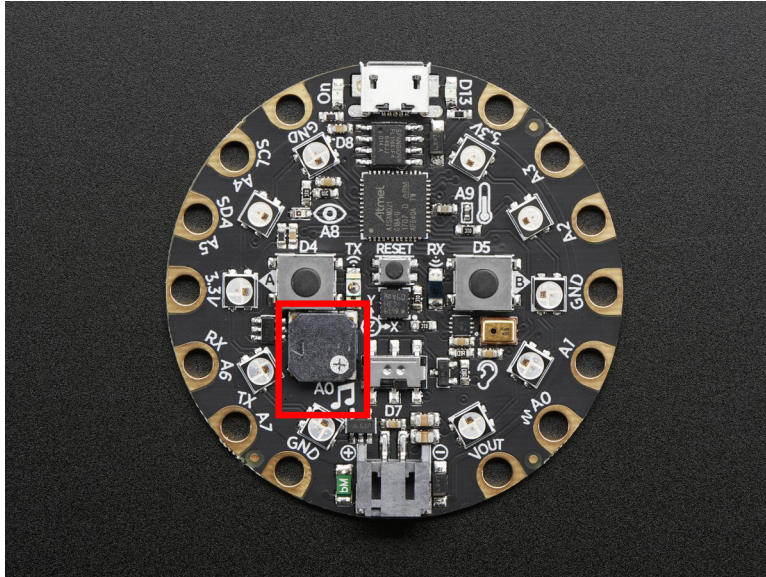
```
from adafruit_circuitplayground import cp

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

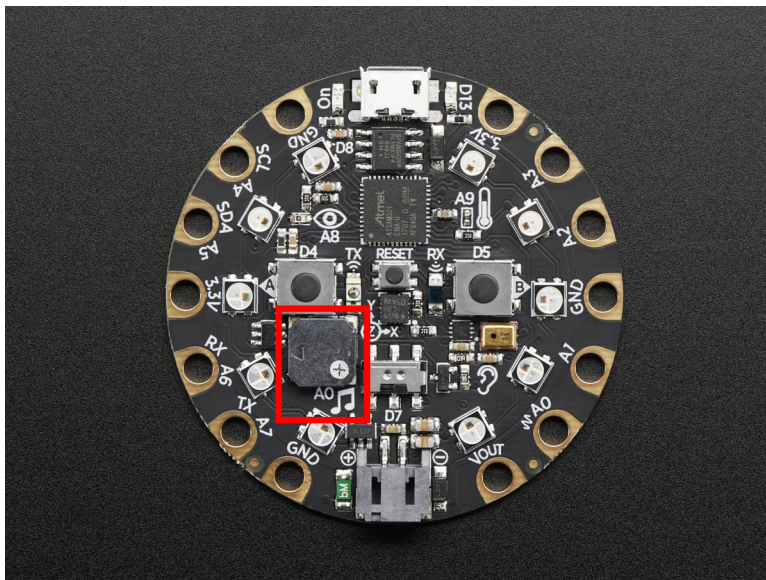
while True:
    if cp.button_a:
        cp.play_file("laugh.wav")
    elif cp.button_b:
        cp.play_file("rimshot.wav")
```

**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



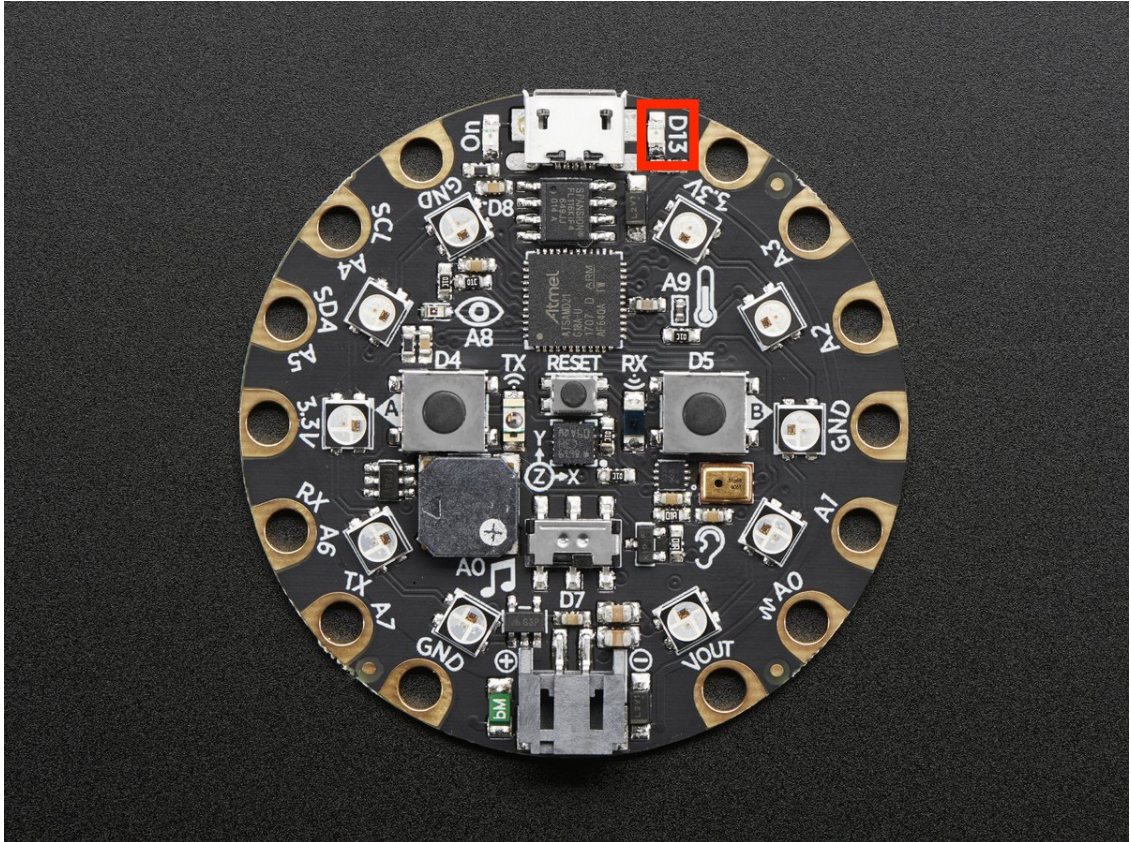


To use with the Circuit Playground Express or Bluefruit:

```
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:

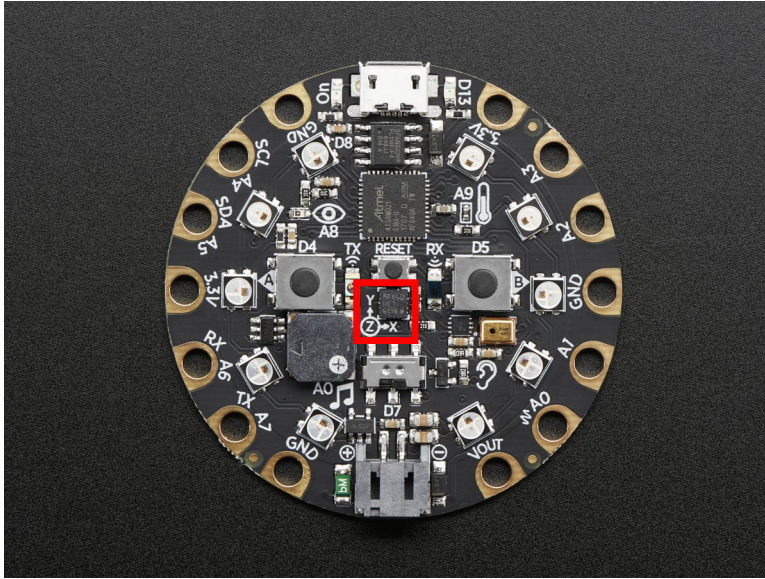
```
from adafruit_circuitplayground import cp
import time

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

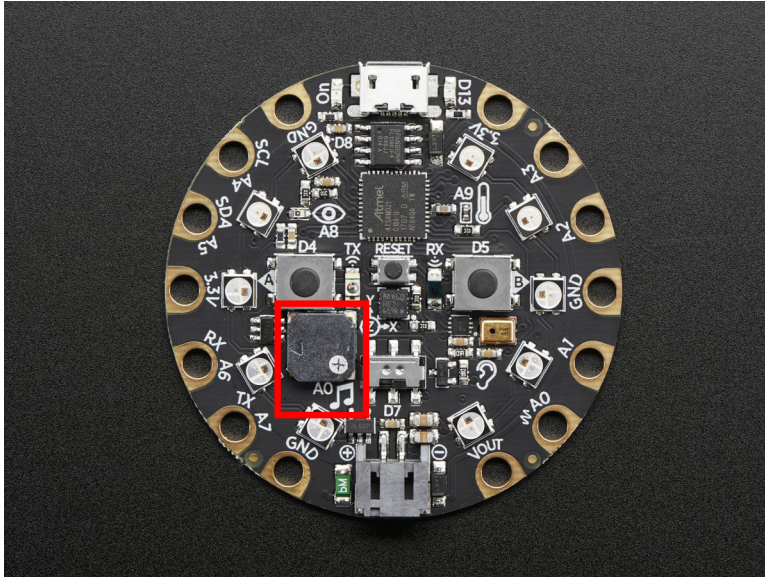
while True:
    if cp.shake(shake_threshold=20):
        print("Shake detected more easily than before!")
```

**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





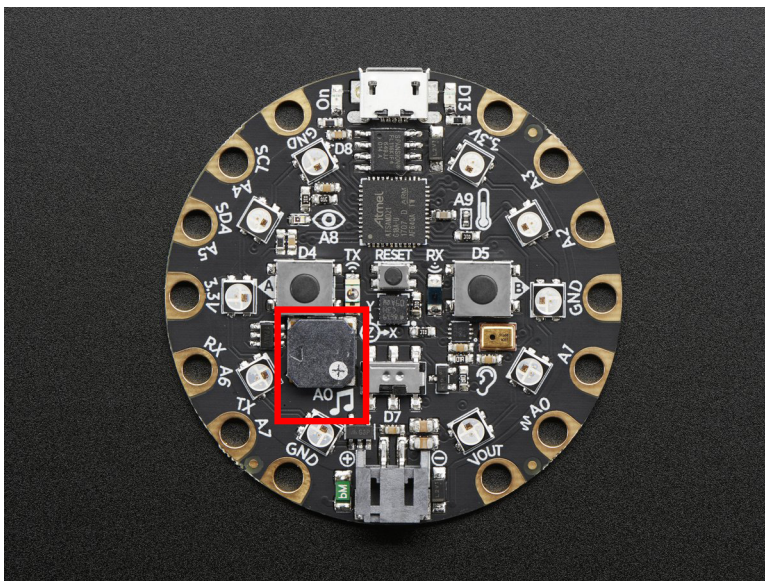
To use with the Circuit Playground Express or Bluefruit:

```
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:

```

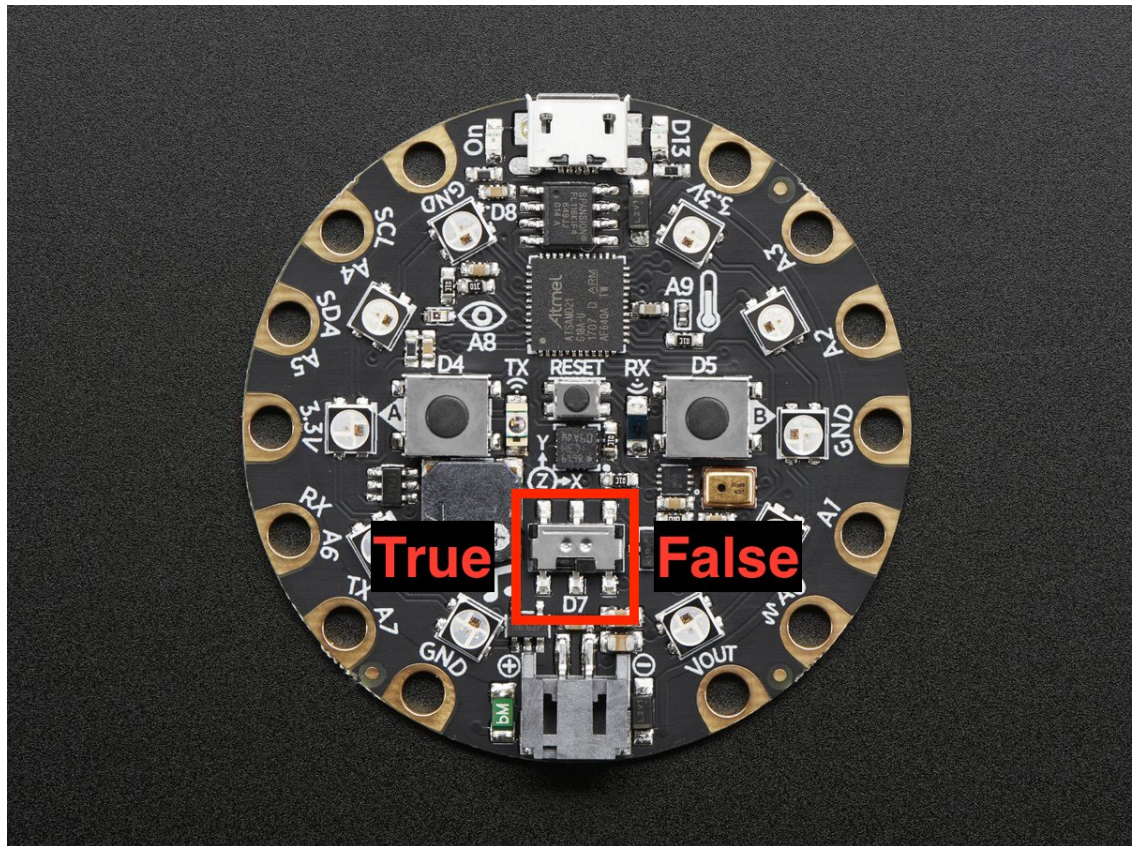
from adafruit_circuitplayground import cp

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 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

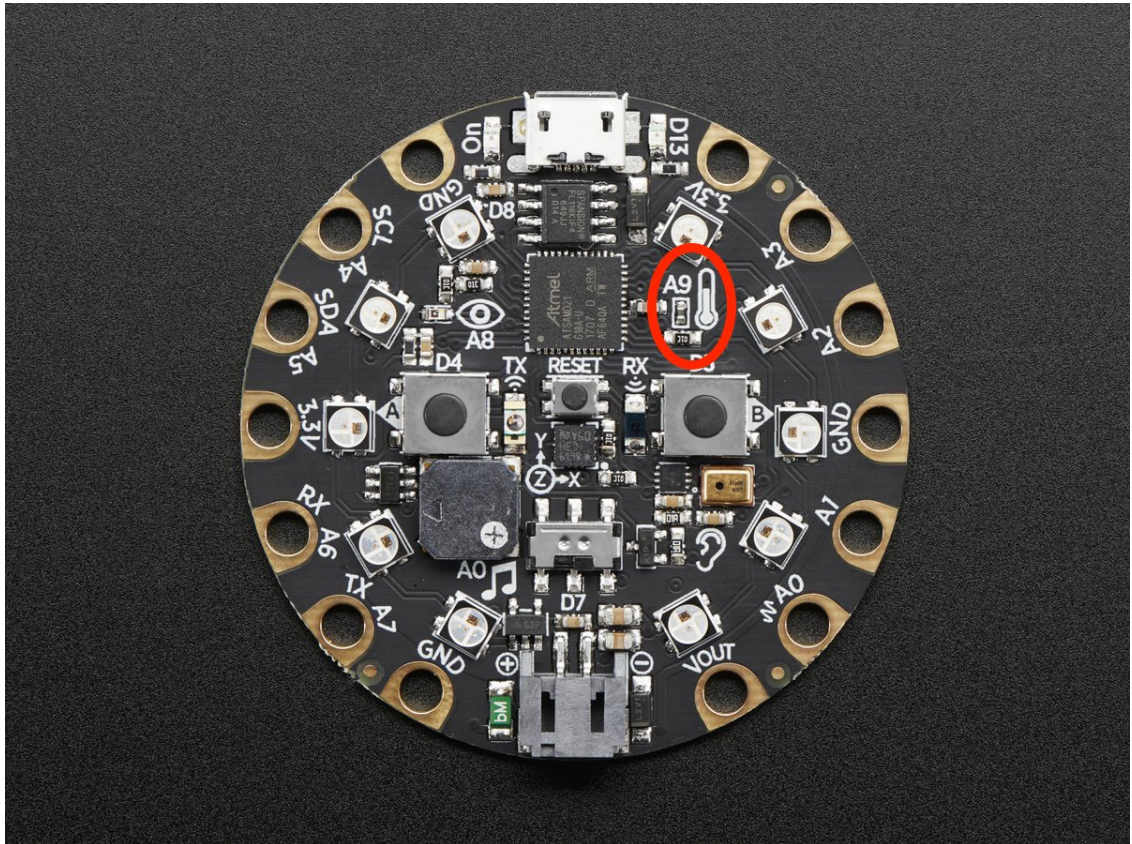
# We're looking for 2 single-taps before moving on.
while tap_count < 2:
    if cp.tapped:
        tap_count += 1
print("Reached 2 single-taps!")

# 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:

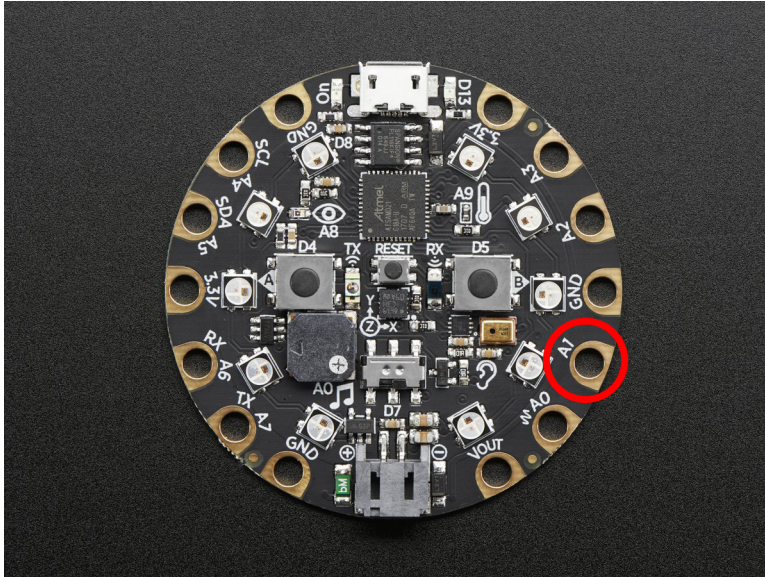
```
from adafruit_circuitplayground import cp
import time

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.





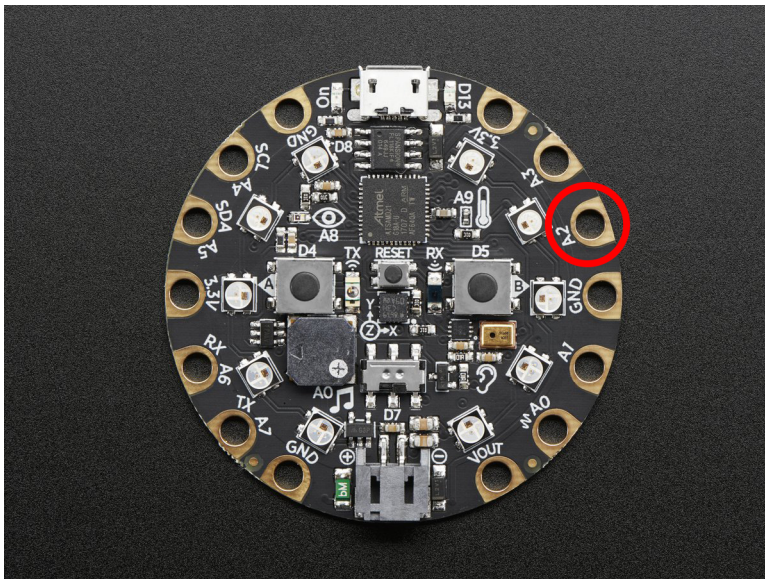
To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

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

#### `touch_A2`

Detect touch on capacitive touch pad A2.



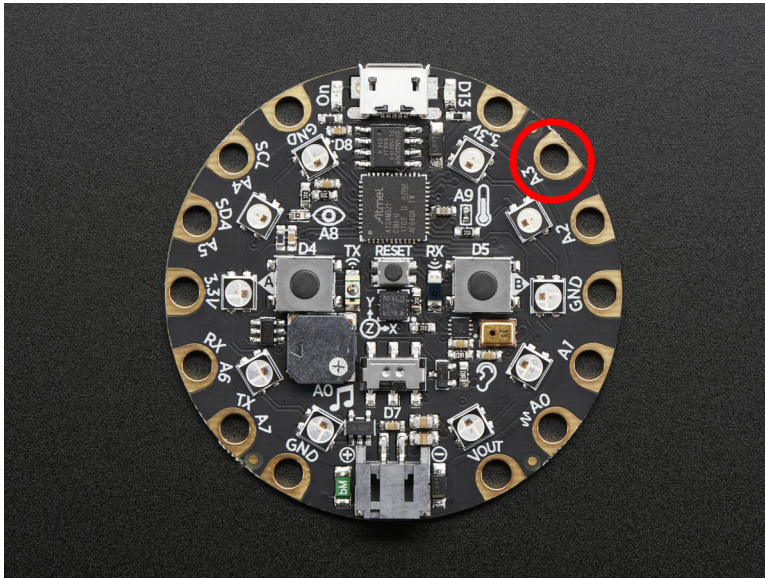
To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

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

### `touch_A3`

Detect touch on capacitive touch pad A3.



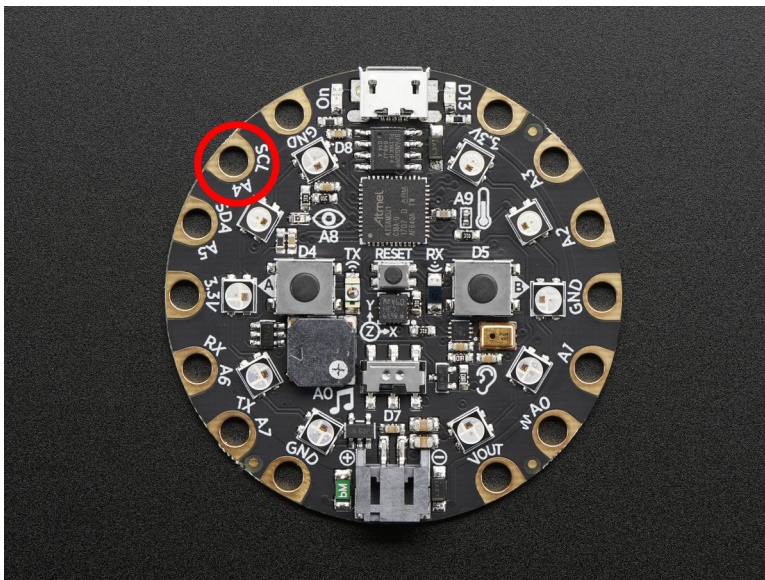
To use with the Circuit Playground Express or Bluefruit:

```
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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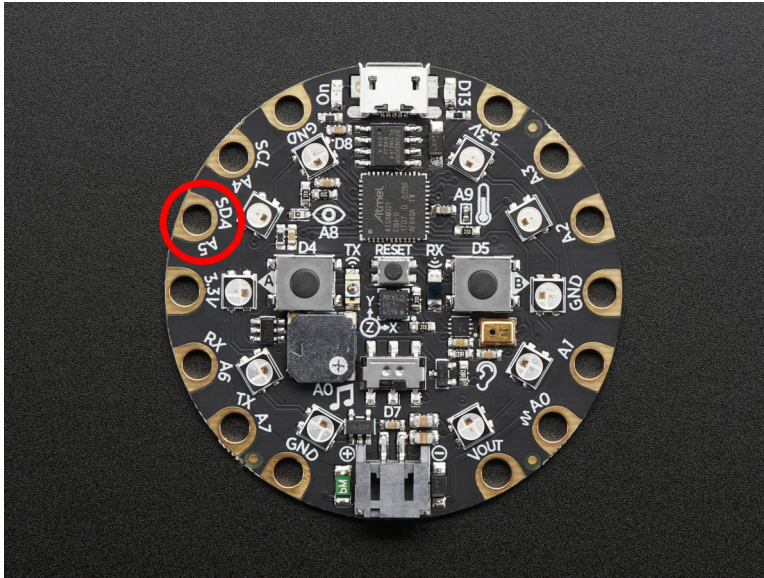


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```
while True:
    if cp.touch_A4:
        print('Touched pad A4')
```

**touch\_A5**

Detect touch on capacitive touch pad A5.



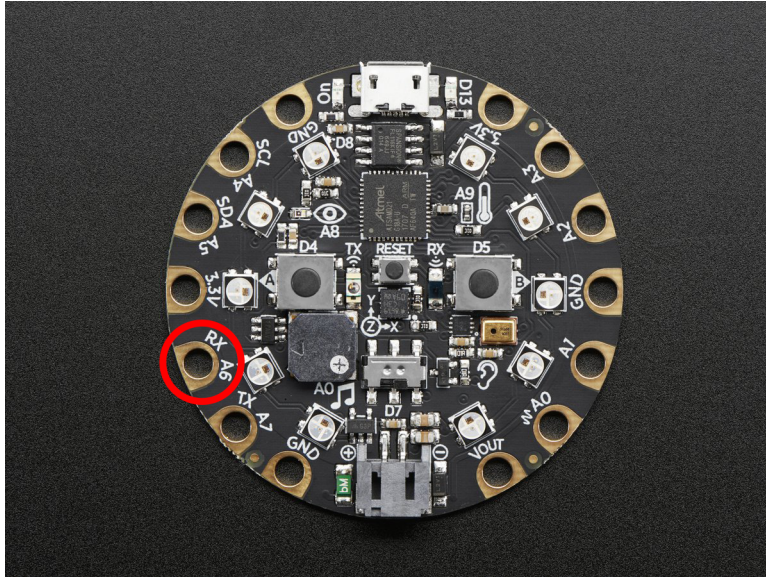
To use with the Circuit Playground Express or Bluefruit:

```
from adafruit_circuitplayground import cp

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

**touch\_A6**

Detect touch on capacitive touch pad A6.



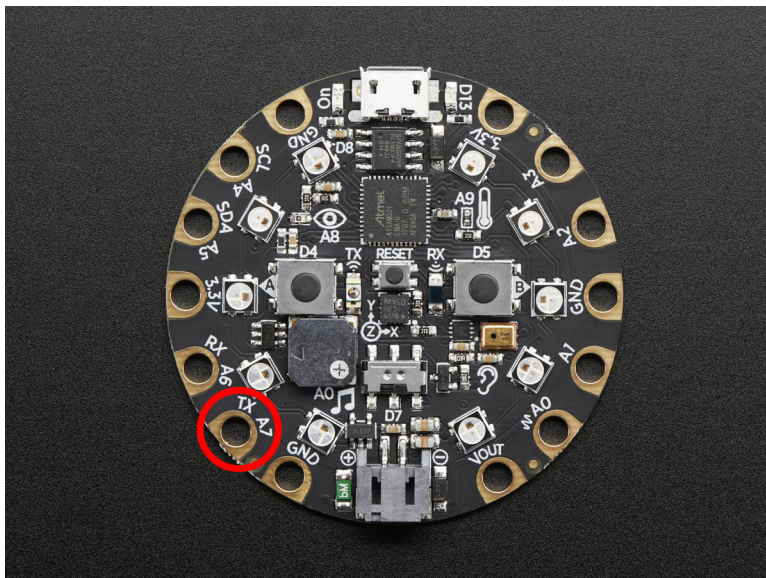
To use with the Circuit Playground Express or Bluefruit:

```
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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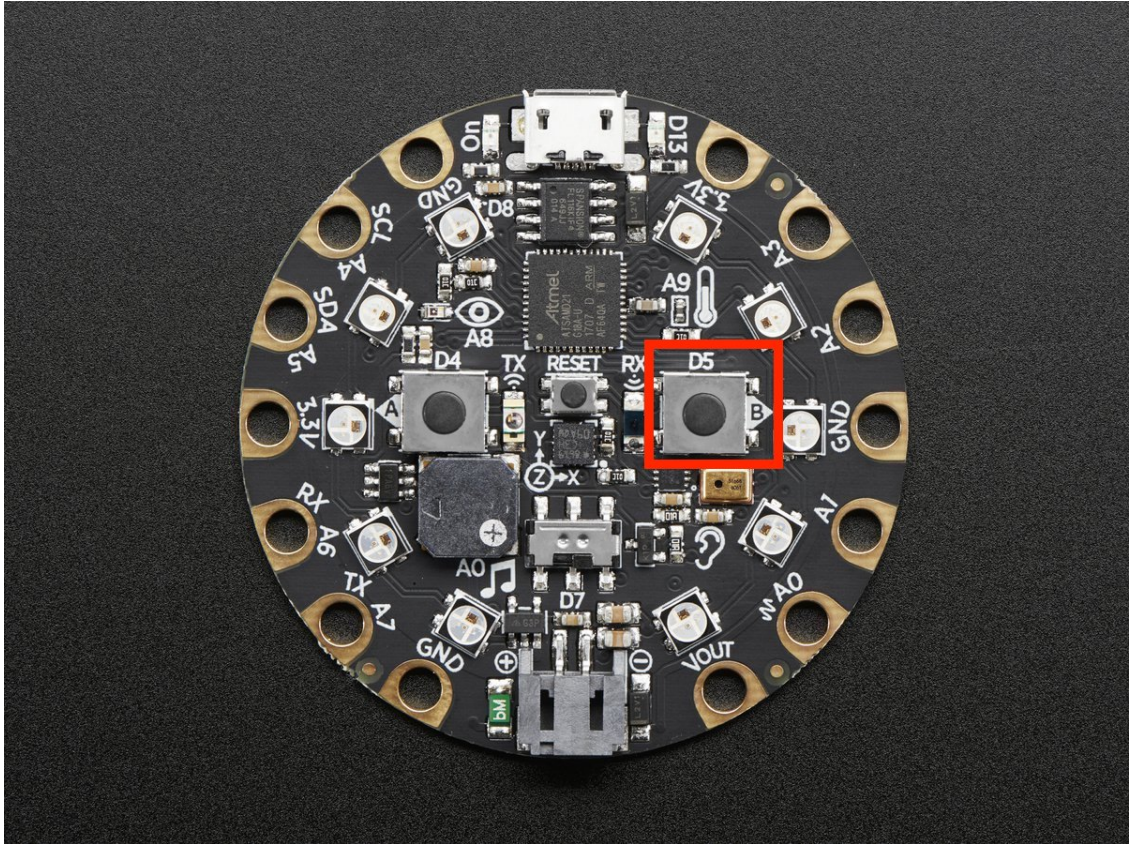
```

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.**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

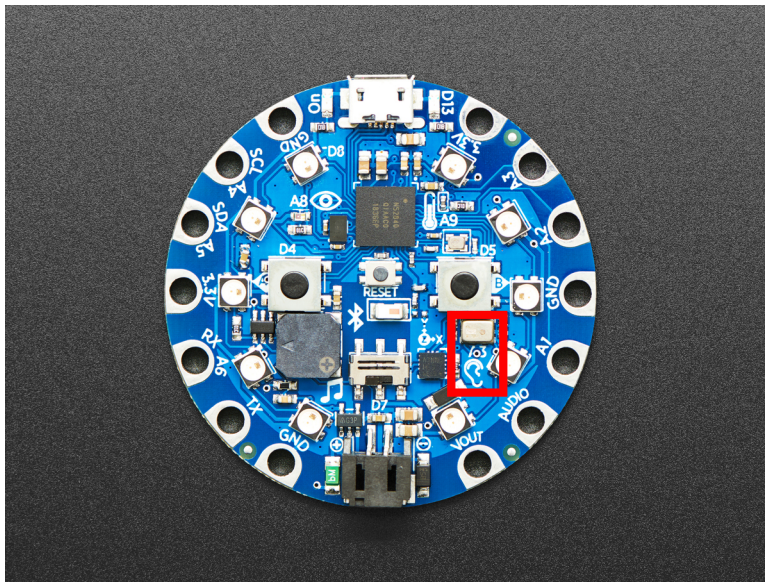
**class** adafruit\_circuitplayground.bluefruit.**Bluefruit**

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

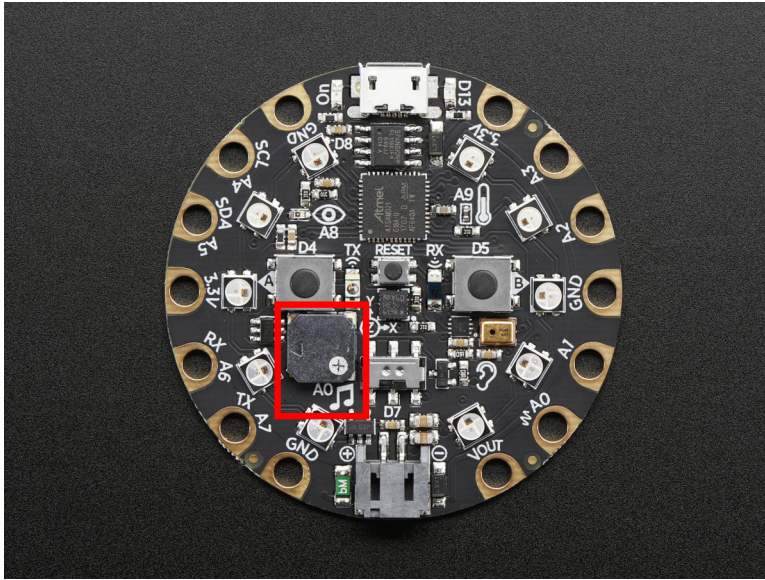
while True:
    if cpb.loud_sound(sound_threshold=300):
        cpb.pixels.fill((50, 0, 0))
    else:
        cpb.pixels.fill(0)
```



**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



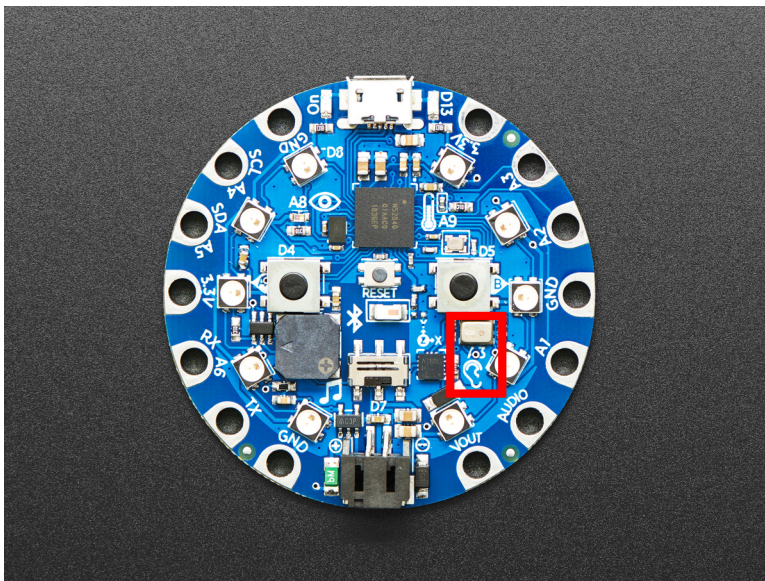
To use with the Circuit Playground Bluefruit:

```
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`

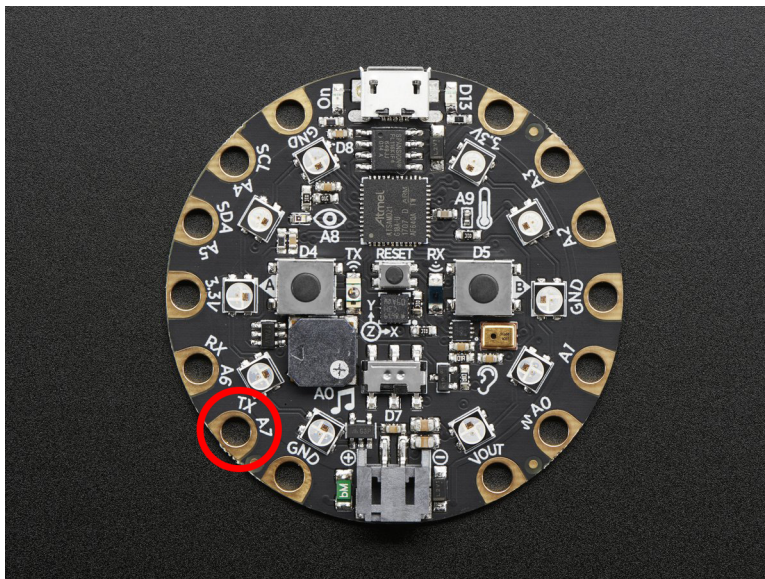
This feature is not supported on Circuit Playground Express.

### `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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