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# **Adafruit HT16K33 Library Documentation**

***Release 1.0***

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This is a library for using the I<sup>2</sup>C-based LED matrices with the HT16K33 chip. It supports both 16x8 and 8x8 matrices, as well as 7- and 14-segment displays.

- **Notes**

1. This library is intended for Adafruit CircuitPython's API. For a library compatible with MicroPython machine API see this [library](#).
2. This library does not work with the Trellis 4x4 LED+Keypad board. For that product use: [CircuitPython Trellis Library](#)



# CHAPTER 1

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## Dependencies

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This driver depends on:

- [Adafruit CircuitPython](#)
- [Bus Device](#)

Please ensure all dependencies are available on the CircuitPython filesystem. This is easily achieved by downloading the [Adafruit library and driver bundle](#).





## CHAPTER 2

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### Installing from PyPI

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On supported GNU/Linux systems like the Raspberry Pi, you can install the driver locally [from PyPI](#). To install for current user:

```
pip3 install adafruit-circuitpython-ht16k33
```

To install system-wide (this may be required in some cases):

```
sudo pip3 install adafruit-circuitpython-ht16k33
```

To install in a virtual environment in your current project:

```
mkdir project-name && cd project-name
python3 -m venv .env
source .env/bin/activate
pip3 install adafruit-circuitpython-ht16k33
```



## CHAPTER 3

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### Usage Example

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```
# Import all board pins and bus interface.
import board
import busio

# Import the HT16K33 LED matrix module.
from adafruit_ht16k33 import matrix

# Create the I2C interface.
i2c = busio.I2C(board.SCL, board.SDA)

# Create the matrix class.
# This creates a 16x8 matrix:
matrix = matrix.Matrix16x8(i2c)
# Or this creates a 8x8 matrix:
#matrix = matrix.Matrix8x8(i2c)
# Or this creates a 8x8 bicolor matrix:
#matrix = matrix.Matrix8x8x2
# Finally you can optionally specify a custom I2C address of the HT16k33 like:
#matrix = matrix.Matrix16x8(i2c, address=0x70)

# Clear the matrix.
matrix.fill(0)

# Set a pixel in the origin 0,0 position.
matrix[0, 0] = 1
# Set a pixel in the middle 8, 4 position.
matrix[8, 4] = 1
# Set a pixel in the opposite 15, 7 position.
matrix[15, 7] = 1
matrix.show()

# Change the brightness
matrix.brightness = 8
```

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```
# Set the blink rate
matrix.blink_rate = 2
```

## 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](#).





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## Table of Contents

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### 6.1 Simple test

Ensure your device works with this simple test.

Listing 1: examples/ht16k33\_matrix\_simpletest.py

```
1  # Basic example of clearing and drawing a pixel on a LED matrix display.
2  # This example and library is meant to work with Adafruit CircuitPython API.
3  # Author: Tony DiCola
4  # License: Public Domain
5
6  # Import all board pins.
7  import time
8  import board
9  import busio
10
11 # Import the HT16K33 LED matrix module.
12 from adafruit_ht16k33 import matrix
13
14
15 # Create the I2C interface.
16 i2c = busio.I2C(board.SCL, board.SDA)
17
18 # Create the matrix class.
19 # This creates a 16x8 matrix:
20 matrix = matrix.Matrix16x8(i2c)
21 # Or this creates a 16x8 matrix backpack:
22 # matrix = matrix.MatrixBackpack16x8(i2c)
23 # Or this creates a 8x8 matrix:
24 #matrix = matrix.Matrix8x8(i2c)
25 # Or this creates a 8x8 bicolor matrix:
26 #matrix = matrix.Matrix8x8x2(i2c)
27 # Finally you can optionally specify a custom I2C address of the HT16k33 like:
```

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```

28 #matrix = matrix.Matrix16x8(i2c, address=0x70)
29
30 # Clear the matrix.
31 matrix.fill(0)
32
33 # Set a pixel in the origin 0, 0 position.
34 matrix[0, 0] = 1
35 # Set a pixel in the middle 8, 4 position.
36 matrix[8, 4] = 1
37 # Set a pixel in the opposite 15, 7 position.
38 matrix[15, 7] = 1
39
40 time.sleep(2)
41
42 # Draw a Smiley Face
43 for row in range(2, 6):
44     matrix[row, 0] = 1
45     matrix[row, 7] = 1
46
47 for column in range(2, 6):
48     matrix[0, column] = 1
49     matrix[7, column] = 1
50
51 matrix[1, 1] = 1
52 matrix[1, 6] = 1
53 matrix[6, 1] = 1
54 matrix[6, 6] = 1
55 matrix[2, 5] = 1
56 matrix[5, 5] = 1
57 matrix[2, 3] = 1
58 matrix[5, 3] = 1
59 matrix[3, 2] = 1
60 matrix[4, 2] = 1
61
62 # Move the Smiley Face Around
63 while True:
64     for frame in range(0, 8):
65         matrix.shift_right(True)
66         time.sleep(0.05)
67     for frame in range(0, 8):
68         matrix.shift_down(True)
69         time.sleep(0.05)
70     for frame in range(0, 8):
71         matrix.shift_left(True)
72         time.sleep(0.05)
73     for frame in range(0, 8):
74         matrix.shift_up(True)
75         time.sleep(0.05)

```

Listing 2: examples/ht16k33\_segments\_simpletest.py

```

1 # Basic example of setting digits on a LED segment display.
2 # This example and library is meant to work with Adafruit CircuitPython API.
3 # Author: Tony DiCola
4 # License: Public Domain
5

```

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```

6  import time
7
8  # Import all board pins.
9  import board
10 import busio
11
12 # Import the HT16K33 LED segment module.
13 from adafruit_ht16k33 import segments
14
15 # Create the I2C interface.
16 i2c = busio.I2C(board.SCL, board.SDA)
17
18 # Create the LED segment class.
19 # This creates a 7 segment 4 character display:
20 display = segments.Seg7x4(i2c)
21 # Or this creates a 14 segment alphanumeric 4 character display:
22 #display = segments.Seg14x4(i2c)
23 # Finally you can optionally specify a custom I2C address of the HT16k33 like:
24 #display = segments.Seg7x4(i2c, address=0x70)
25
26 # Clear the display.
27 display.fill(0)
28
29 # Can just print a number
30 display.print(42)
31 time.sleep(2)
32
33 # Or, can set individual digits / characters
34 # Set the first character to '1':
35 display[0] = '1'
36 # Set the second character to '2':
37 display[1] = '2'
38 # Set the third character to 'A':
39 display[2] = 'A'
40 # Set the forth character to 'B':
41 display[3] = 'B'
42 time.sleep(2)
43
44 # Or, can even set the segments to make up characters
45 if isinstance(display, segments.Seg7x4):
46     # 7-segment raw digits
47     display.set_digit_raw(0, 0xFF)
48     display.set_digit_raw(1, 0b11111111)
49     display.set_digit_raw(2, 0x79)
50     display.set_digit_raw(3, 0b01111001)
51 else:
52     # 14-segment raw digits
53     display.set_digit_raw(0, 0x3F2D)
54     display.set_digit_raw(1, 0b0011111100101101)
55     display.set_digit_raw(2, (0b00111111, 0b00101101))
56     display.set_digit_raw(3, [0b00111111, 0b00101101])
57
58 #Show a looping marquee
59 display.marquee('Deadbeef 192.168.100.102... ', 0.2)

```

Listing 3: examples/ht16k33\_bicolor24\_simpletest.py

```
1  # Basic example of using the Bi-color 24 segment bargraph display.
2  # This example and library is meant to work with Adafruit CircuitPython API.
3  # Author: Carter Nelson
4  # License: Public Domain
5
6  import time
7
8  # Import board related modules
9  import board
10 import busio
11
12 # Import the Bicolor24 driver from the HT16K33 module
13 from adafruit_ht16k33.bargraph import Bicolor24
14
15 # Create the I2C interface
16 i2c = busio.I2C(board.SCL, board.SDA)
17
18 # Create the LED bargraph class.
19 bc24 = Bicolor24(i2c)
20
21 # Set individual segments of bargraph
22 bc24[0] = bc24.LED_RED
23 bc24[1] = bc24.LED_GREEN
24 bc24[2] = bc24.LED_YELLOW
25
26 time.sleep(2)
27
28 # Turn them all off
29 bc24.fill(bc24.LED_OFF)
30
31 # Turn them on in a loop
32 for i in range(24):
33     bc24[i] = bc24.LED_RED
34     time.sleep(0.1)
35     bc24[i] = bc24.LED_OFF
36
37 time.sleep(1)
38
39 # Fill the entire bargraph
40 bc24.fill(bc24.LED_GREEN)
```

## 6.2 adafruit\_ht16k33.ht16k33

- Authors: Radomir Dopieralski & Tony DiCola for Adafruit Industries

**class** adafruit\_ht16k33.ht16k33.**HT16K33** (*i2c*, *address=112*, *auto\_write=True*)

The base class for all displays. Contains common methods.

### Parameters

- **address** (*int*) – The I2C address of the HT16K33.
- **auto\_write** (*bool*) – True if the display should immediately change when set. If False, *show* must be called explicitly.

**auto\_write**

Auto write updates to the display.

**blink\_rate**

The blink rate. Range 0-3.

**brightness**

The brightness. Range 0-15.

**fill** (*color*)

Fill the whole display with the given color.

**show** ()

Refresh the display and show the changes.

## 6.3 Matrix Displays

**class** adafruit\_ht16k33.matrix.**Matrix16x8** (*i2c, address=112, auto\_write=True*)

The matrix wing.

**pixel** (*x, y, color=None*)

Get or set the color of a given pixel.

**class** adafruit\_ht16k33.matrix.**Matrix8x8** (*i2c, address=112, auto\_write=True*)

A single matrix.

**columns**

Read-only property for number of columns

**pixel** (*x, y, color=None*)

Get or set the color of a given pixel.

**rows**

Read-only property for number of rows

**shift** (*x, y, rotate=False*)

Shift pixels by x and y

**Parameters** **rotate** – (Optional) Rotate the shifted pixels to the left side (default=False)

**shift\_down** (*rotate=False*)

Shift all pixels down

**Parameters** **rotate** – (Optional) Rotate the shifted pixels to top (default=False)

**shift\_left** (*rotate=False*)

Shift all pixels left

**Parameters** **rotate** – (Optional) Rotate the shifted pixels to the right side (default=False)

**shift\_right** (*rotate=False*)

Shift all pixels right

**Parameters** **rotate** – (Optional) Rotate the shifted pixels to the left side (default=False)

**shift\_up** (*rotate=False*)

Shift all pixels up

**Parameters** **rotate** – (Optional) Rotate the shifted pixels to bottom (default=False)

**class** adafruit\_ht16k33.matrix.**Matrix8x8x2** (*i2c, address=112, auto\_write=True*)

A bi-color matrix.

**fill** (*color*)

Fill the whole display with the given color.

**pixel** (*x*, *y*, *color=None*)

Get or set the color of a given pixel.

**class** adafruit\_ht16k33.matrix.**MatrixBackpack16x8** (*i2c*, *address=112*, *auto\_write=True*)

A double matrix backpack.

**pixel** (*x*, *y*, *color=None*)

Get or set the color of a given pixel.

## 6.4 Segment Displays

**class** adafruit\_ht16k33.segments.**BigSeg7x4** (*i2c*, *address=112*, *auto\_write=True*)

Numeric 7-segment display. It has the same methods as the alphanumeric display, but only supports displaying a limited set of characters.

**ampm**

The AM/PM indicator.

**bottom\_left\_dot**

The bottom-left dot indicator.

**top\_left\_dot**

The top-left dot indicator.

**class** adafruit\_ht16k33.segments.**Colon** (*disp*, *num\_of\_colons=1*)

Helper class for controlling the colons. Not intended for direct use.

**class** adafruit\_ht16k33.segments.**Seg14x4** (*i2c*, *address=112*, *auto\_write=True*)

Alpha-numeric, 14-segment display.

**marquee** (*text*, *delay=0.25*, *loop=True*)

Automatically scroll the text at the specified delay between characters

### Parameters

- **text** (*str*) – The text to display
- **delay** (*float*) – (optional) The delay in seconds to pause before scrolling to the next character (default=0.25)
- **loop** (*bool*) – (optional) Whether to endlessly loop the text (default=True)

**print** (*value*)

Print the value to the display.

**scroll** (*count=1*)

Scroll the display by specified number of places.

**set\_digit\_raw** (*index*, *bitmask*)

Set digit at position to raw bitmask value. Position should be a value of 0 to 3 with 0 being the left most character on the display.

bitmask should be 2 bytes such as: 0xFFFF If can be passed as an integer, list, or tuple

**class** adafruit\_ht16k33.segments.**Seg7x4** (*i2c*, *address=112*, *auto\_write=True*)

Numeric 7-segment display. It has the same methods as the alphanumeric display, but only supports displaying a limited set of characters.

**scroll** (*count=1*)

Scroll the display by specified number of places.

**set\_digit\_raw** (*index, bitmask*)

Set digit at position to raw bitmask value. Position should be a value of 0 to 3 with 0 being the left most digit on the display.





## CHAPTER 7

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### Indices and tables

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