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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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### 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 3

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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 4

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### Building locally

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To build this library locally you'll need to install the `circuitpython-build-tools` package.

```
python3 -m venv .env
source .env/bin/activate
pip install circuitpython-build-tools
```

Once installed, make sure you are in the virtual environment:

```
source .env/bin/activate
```

Then run the build:

```
circuitpython-build-bundles --filename_prefix adafruit-circuitpython-ht16k33 --
↳library_location .
```

### 4.1 Sphinx documentation

Sphinx is used to build the documentation based on rST files and comments in the code. First, install dependencies (feel free to reuse the virtual environment from above):

```
python3 -m venv .env
source .env/bin/activate
pip install Sphinx sphinx-rtd-theme
```

Now, once you have the virtual environment activated:

```
cd docs
sphinx-build -E -W -b html . _build/html
```

This will output the documentation to `docs/_build/html`. Open the `index.html` in your browser to view them. It will also (due to `-W`) error out on any warning like Travis will. This is a good way to locally verify it will pass.



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Table of Contents

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## 5.1 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 board
8  import busio
9
10 # Import the HT16K33 LED matrix module.
11 from adafruit_ht16k33 import matrix
12
13
14 # Create the I2C interface.
15 i2c = busio.I2C(board.SCL, board.SDA)
16
17 # Create the matrix class.
18 # This creates a 16x8 matrix:
19 matrix = matrix.Matrix16x8(i2c)
20 # Or this creates a 8x8 matrix:
21 #matrix = matrix.Matrix8x8(i2c)
22 # Or this creates a 8x8 bicolor matrix:
23 #matrix = matrix.Matrix8x8x2(i2c)
24 # Finally you can optionally specify a custom I2C address of the HT16k33 like:
25 #matrix = matrix.Matrix16x8(i2c, address=0x70)
26
27 # Clear the matrix.
```

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```
28 matrix.fill(0)
29
30 # Set a pixel in the origin 0,0 position.
31 matrix[0, 0] = 1
32 # Set a pixel in the middle 8, 4 position.
33 matrix[8, 4] = 1
34 # Set a pixel in the opposite 15, 7 position.
35 matrix[15, 7] = 1
```

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
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
16 # Create the I2C interface.
17 i2c = busio.I2C(board.SCL, board.SDA)
18
19 # Create the LED segment class.
20 # This creates a 7 segment 4 character display:
21 display = segments.Seg7x4(i2c)
22 # Or this creates a 14 segment alphanumeric 4 character display:
23 #display = segments.Seg14x4(i2c)
24 # Finally you can optionally specify a custom I2C address of the HT16k33 like:
25 #display = segments.Seg7x4(i2c, address=0x70)
26
27 # Clear the display.
28 display.fill(0)
29
30 # Can just print a number
31 display.print(42)
32 time.sleep(2)
33
34 # Or, can set individual digits / characters
35 # Set the first character to '1':
36 display[0] = '1'
37 # Set the second character to '2':
38 display[1] = '2'
39 # Set the third character to 'A':
40 display[2] = 'A'
41 # Set the forth character to 'B':
42 display[3] = 'B'
```



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)

```

## 5.2 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.

## 5.3 Matrix Displays

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

A double matrix or 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.

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

Get or set the color of a given pixel.

**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.

## 5.4 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.

**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.

**print** (*value*)

Print the value to the display.

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

Scroll the display by specified number of places.

**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.



## CHAPTER 6

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### Indices and tables

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