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# **Adafruit PCF8523 RTC Library Documentation**

***Release 1.0***

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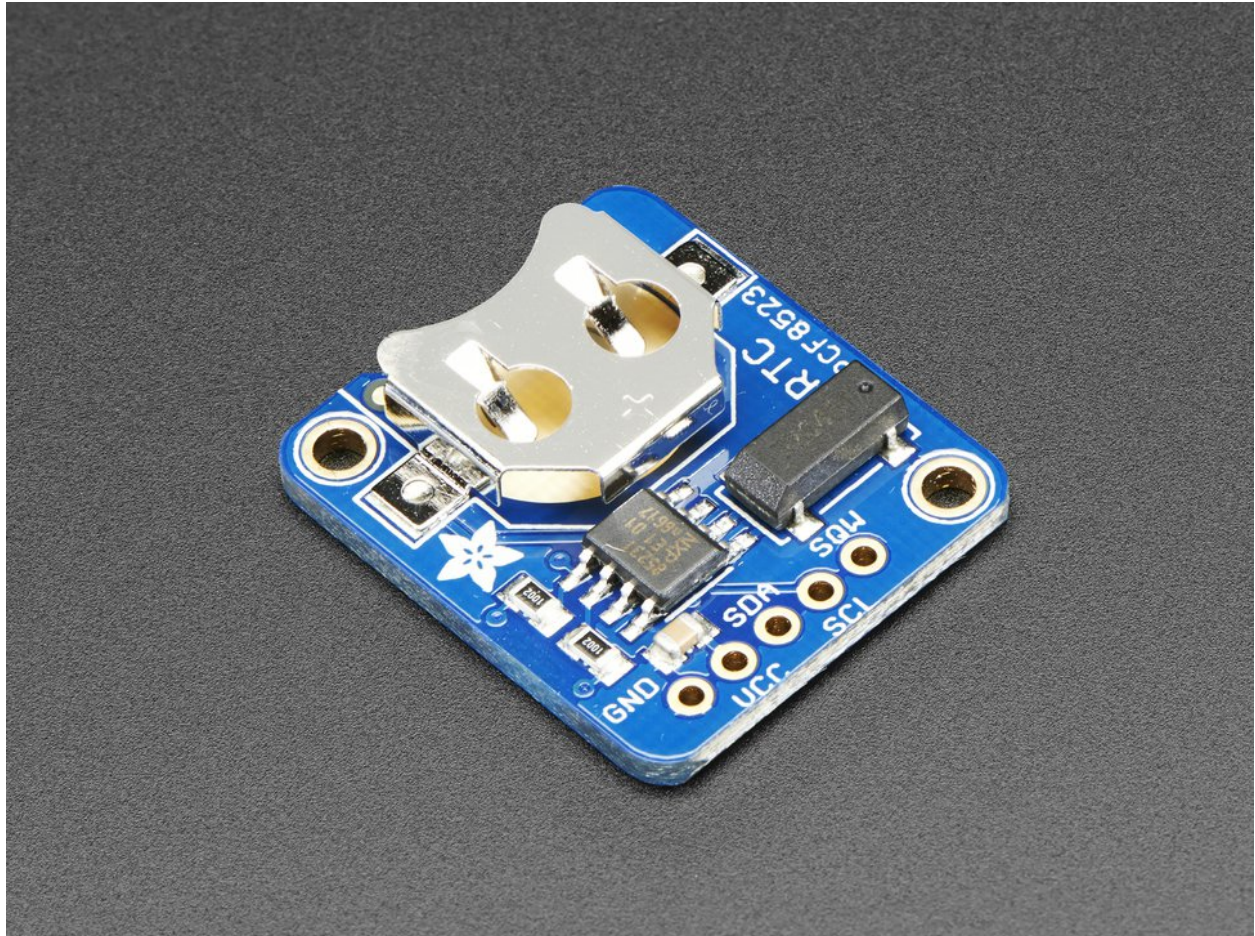
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This is a great battery-backed real time clock (RTC) that allows your microcontroller project to keep track of time even if it is reprogrammed, or if the power is lost. Perfect for datalogging, clock-building, time stamping, timers and alarms, etc. Equipped with PCF8523 RTC - it can run from 3.3V or 5V power & logic!

The PCF8523 is simple and inexpensive but not a high precision device. It may lose or gain up to two seconds a day. For a high-precision, temperature compensated alternative, please check out the [DS3231 precision RTC](#). If you need a DS1307 for compatibility reasons, check out our [DS1307 RTC breakout](#).





# CHAPTER 1

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## Dependencies

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This driver depends on the [Register](#) and [Bus Device](#) libraries. Please ensure they are also available on the CircuitPython filesystem. This is easily achieved by downloading [a 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-pcf8523
```

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

```
sudo pip3 install adafruit-circuitpython-pcf8523
```

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-pcf8523
```



### 3.1 Basics

Of course, you must import the library to use it:

```
import busio
import adafruit_pcf8523
import time
```

All the Adafruit RTC libraries take an instantiated and active I2C object (from the `busio` library) as an argument to their constructor. The way to create an I2C object depends on the board you are using. For boards with labeled SCL and SDA pins, you can:

```
from board import *
```

You can also use pins defined by the onboard `microcontroller` through the `microcontroller.Pin` module.

Now, to initialize the I2C bus:

```
i2c_bus = busio.I2C(SCL, SDA)
```

Once you have created the I2C interface object, you can use it to instantiate the RTC object:

```
rtc = adafruit_pcf8523.PCF8523(i2c_bus)
```

### 3.2 Date and time

To set the time, you need to set `datetime` to a `time.struct_time` object:

```
rtc.datetime = time.struct_time((2017, 1, 9, 15, 6, 0, 0, 9, -1))
```

After the RTC is set, you retrieve the time by reading the `datetime` attribute and access the standard attributes of a `struct_time` such as `tm_year`, `tm_hour` and `tm_min`.

```
t = rtc.datetime
print(t)
print(t.tm_hour, t.tm_min)
```

## 3.3 Alarm

To set the time, you need to set `alarm` to a tuple with a `time.struct_time` object and string representing the frequency such as “hourly”:

```
rtc.alarm = (time.struct_time((2017,1,9,15,6,0,0,9,-1)), "daily")
```

After the RTC is set, you retrieve the alarm status by reading the `alarm_status` attribute. Once True, set it back to False to reset.

```
if rtc.alarm_status:
    print("wake up!")
    rtc.alarm_status = False
```

## 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 Demo

Listing 1: examples/pcf8523\_simpletest.py

```
1  # Simple demo of reading and writing the time for the PCF8523 real-time clock.
2  # Change the if False to if True below to set the time, otherwise it will just
3  # print the current date and time every second. Notice also comments to adjust
4  # for working with hardware vs. software I2C.
5
6  import time
7  import board
8
9  # For hardware I2C (M0 boards) use this line:
10 import busio as io
11
12 # Or for software I2C (ESP8266) use this line instead:
13 # import bitbangio as io
14
15 import adafruit_pcf8523
16
17 # Change to the appropriate I2C clock & data pins here!
18 i2c_bus = io.I2C(board.SCL, board.SDA)
19
20 # Create the RTC instance:
21 rtc = adafruit_pcf8523.PCF8523(i2c_bus)
22
23 # Lookup table for names of days (nicer printing).
24 days = ("Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday")
25
26
27 # pylint: disable-msg=bad-whitespace
28 # pylint: disable-msg=using-constant-test
29 if False: # change to True if you want to set the time!
```

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```

30     #                                year, mon, date, hour, min, sec, wday, yday, isdst
31     t = time.struct_time((2017, 10, 29, 10, 31, 0, 0, -1, -1))
32     # you must set year, mon, date, hour, min, sec and weekday
33     # yearday is not supported, isdst can be set but we don't do anything with it at_
→ this time
34     print("Setting time to:", t) # uncomment for debugging
35     rtc.datetime = t
36     print()
37     # pylint: enable-msg=using-constant-test
38     # pylint: enable-msg=bad-whitespace
39
40     # Main loop:
41     while True:
42         t = rtc.datetime
43         # print(t) # uncomment for debugging
44         print(
45             "The date is {} {}/{}/{}{}".format(
46                 days[int(t.tm_wday)], t.tm_mday, t.tm_mon, t.tm_year
47             )
48         )
49         print("The time is {}:02:02".format(t.tm_hour, t.tm_min, t.tm_sec))
50         time.sleep(1) # wait a second

```

## 6.2 adafruit\_pcf8523 - PCF8523 Real Time Clock module

This library supports the use of the PCF8523-based RTC in CircuitPython. It contains a base RTC class used by all Adafruit RTC libraries. This base class is inherited by the chip-specific subclasses.

Functions are included for reading and writing registers and manipulating datetime objects.

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### 6.2.1 Implementation Notes

#### Hardware:

- Adafruit Adalogger FeatherWing - RTC + SD Add-on (Product ID: 2922)
- Adafruit PCF8523 RTC breakout (Product ID: 3295)

#### Software and Dependencies:

- Adafruit CircuitPython firmware: <https://github.com/adafruit/circuitpython/releases>
- Adafruit's Register library: [https://github.com/adafruit/Adafruit\\_CircuitPython\\_Register](https://github.com/adafruit/Adafruit_CircuitPython_Register)
- Adafruit's Bus Device library: [https://github.com/adafruit/Adafruit\\_CircuitPython\\_BusDevice](https://github.com/adafruit/Adafruit_CircuitPython_BusDevice)

#### Notes:

1. Milliseconds are not supported by this RTC.
2. Datasheet: [http://cache.nxp.com/documents/data\\_sheet/PCF8523.pdf](http://cache.nxp.com/documents/data_sheet/PCF8523.pdf)

**class** `adafruit_pcf8523.PCF8523` (*i2c\_bus*)  
Interface to the PCF8523 RTC.

**alarm**

Alarm time for the first alarm.

**alarm\_interrupt**

True if the interrupt pin will output when alarm is alarming.

**alarm\_status**

True if alarm is alarming. Set to False to reset.

**battery\_low**

True if the battery is low and should be replaced.

**datetime**

Gets the current date and time or sets the current date and time then starts the clock.

**datetime\_register**

Current date and time.

**lost\_power**

True if the device has lost power since the time was set.

**power\_management**

Power management state that dictates battery switchover, power sources and low battery detection. Defaults to BATTERY\_SWITCHOVER\_OFF (0b000).



## CHAPTER 7

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### Indices and tables

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