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# **Adafruit's PCF8523 RTC Library Documentation**

***Release 1.0***

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## Contents

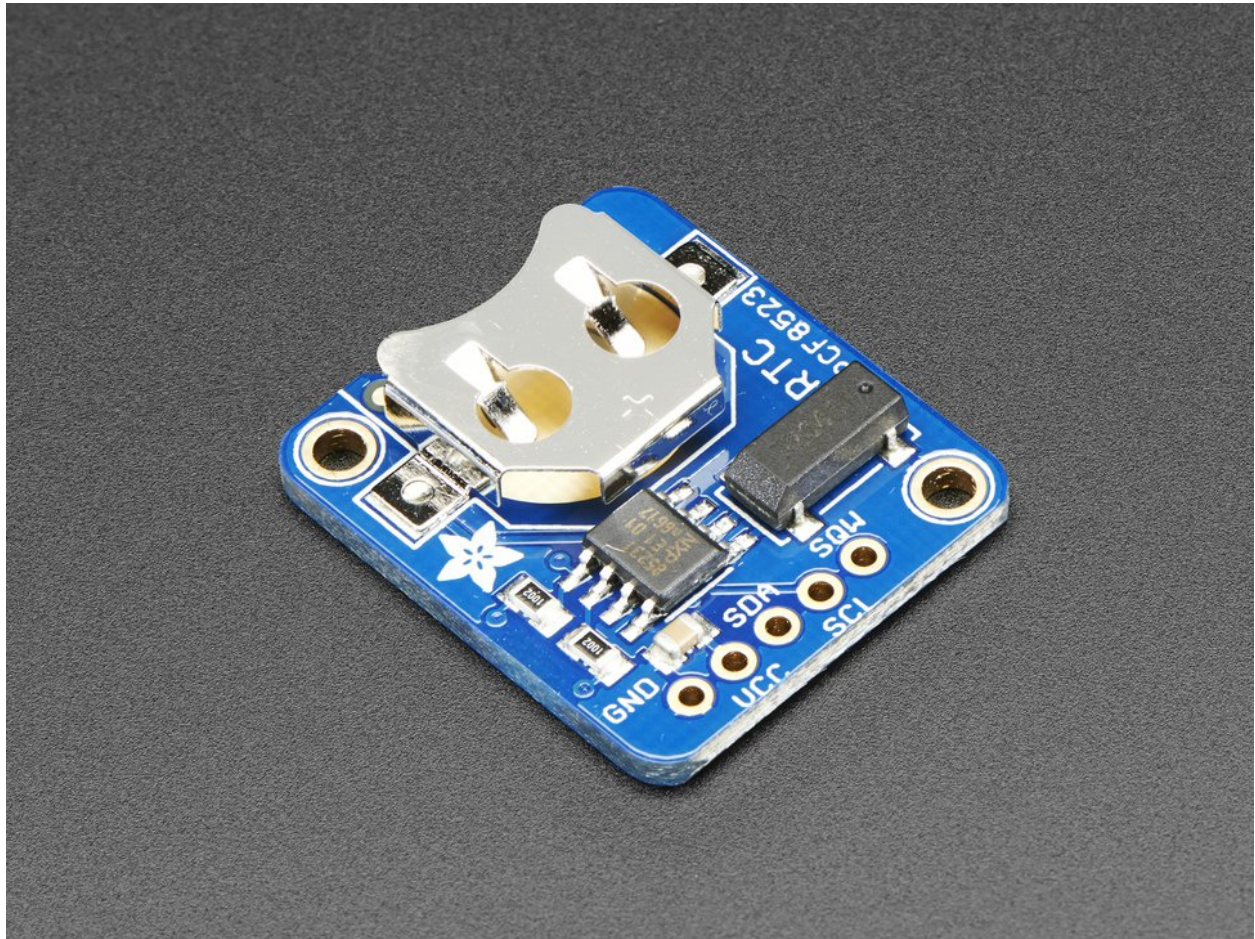
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<b>1</b>	<b>Dependencies</b>	<b>3</b>
<b>2</b>	<b>Usage Notes</b>	<b>5</b>
2.1	Basics . . . . .	5
2.2	Date and time . . . . .	5
2.3	Alarm . . . . .	6
<b>3</b>	<b>Table of Contents</b>	<b>7</b>
3.1	Demo . . . . .	7
3.2	adafruit_pcf8523 - PCF8523 Real Time Clock module . . . . .	8
3.2.1	Implementation Notes . . . . .	8
<b>4</b>	<b>Indices and tables</b>	<b>11</b>
	<b>Python Module Index</b>	<b>13</b>



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](#).





### 2.1 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)
```

### 2.2 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)
```

## 2.3 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
```

### 3.1 Demo

Listing 3.1: examples/demo.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  # For hardware I2C (M0 boards) use this line:
9  import busio as io
10 # Or for software I2C (ESP8266) use this line instead:
11 #import bitbangio as io
12
13 import adafruit_pcf8523
14
15 # Change to the appropriate I2C clock & data pins here!
16 i2c_bus = io.I2C(board.SCL, board.SDA)
17
18 # Create the RTC instance:
19 rtc = adafruit_pcf8523.PCF8523(i2c_bus)
20
21 # Lookup table for names of days (nicer printing).
22 days = ("Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday")
23
24
25 #pylint: disable-msg=bad-whitespace
26 #pylint: disable-msg=using-constant-test
27 if False:    # change to True if you want to set the time!
28     #
29     t = time.struct_time((2017, 10, 29, 10, 31, 0, 0, -1, -1))
30     # you must set year, mon, date, hour, min, sec and weekday
```

```

31     # yearday is not supported, isdst can be set but we don't do anything with it at
↪ this time
32     print("Setting time to:", t)      # uncomment for debugging
33     rtc.datetime = t
34     print()
35 #pylint: enable-msg=using-constant-test
36 #pylint: enable-msg=bad-whitespace
37
38 # Main loop:
39 while True:
40     t = rtc.datetime
41     #print(t)      # uncomment for debugging
42     print("The date is {} {}/{}/{ {}".format(days[int(t.tm_wday)], t.tm_mday, t.tm_mon,
↪ t.tm_year))
43     print("The time is {}:02:02".format(t.tm_hour, t.tm_min, t.tm_sec))
44     time.sleep(1) # wait a second

```

## 3.2 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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### 3.2.1 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 4

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### Indices and tables

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- `genindex`
- `modindex`
- `search`





### **a**

`adafruit_pcf8523`, 8



### A

adafruit\_pcf8523 (module), 8  
alarm (adafruit\_pcf8523.PCF8523 attribute), 8  
alarm\_interrupt (adafruit\_pcf8523.PCF8523 attribute), 8  
alarm\_status (adafruit\_pcf8523.PCF8523 attribute), 8

### B

battery\_low (adafruit\_pcf8523.PCF8523 attribute), 9

### D

datetime (adafruit\_pcf8523.PCF8523 attribute), 9  
datetime\_register (adafruit\_pcf8523.PCF8523 attribute),  
9

### L

lost\_power (adafruit\_pcf8523.PCF8523 attribute), 9

### P

PCF8523 (class in adafruit\_pcf8523), 8  
power\_management (adafruit\_pcf8523.PCF8523 attribute), 9