Module horloge temps réel ADA3295

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!

Works great with an Arduino using our RTC library, with CircuitPython or with a Raspberry Pi (or similar single board linux computer)

- PCB & header are included
- Plugs into any breadboard, or you can use wires
- Two mounting holes
- Will keep time for 5 years or more

Note: This product does not come with a CR1220 coin cell battery. We recommend you purchase a coin cell battery to use with this product.

The PCF8523 is simple and inexpensive but not a high precision device. It may lose or gain up to 2 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

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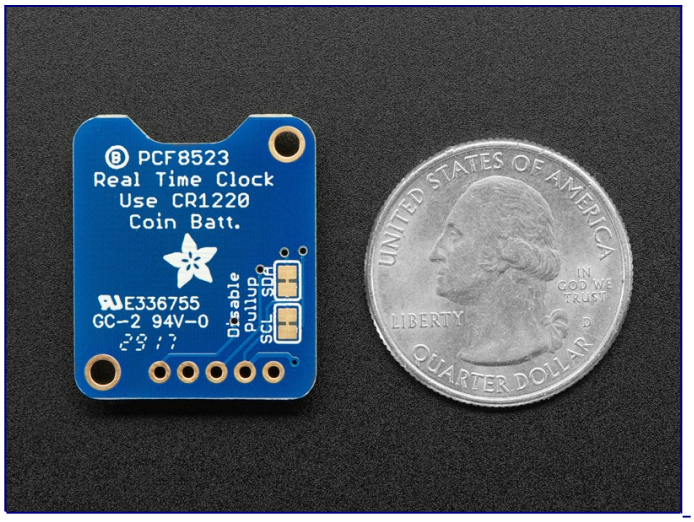

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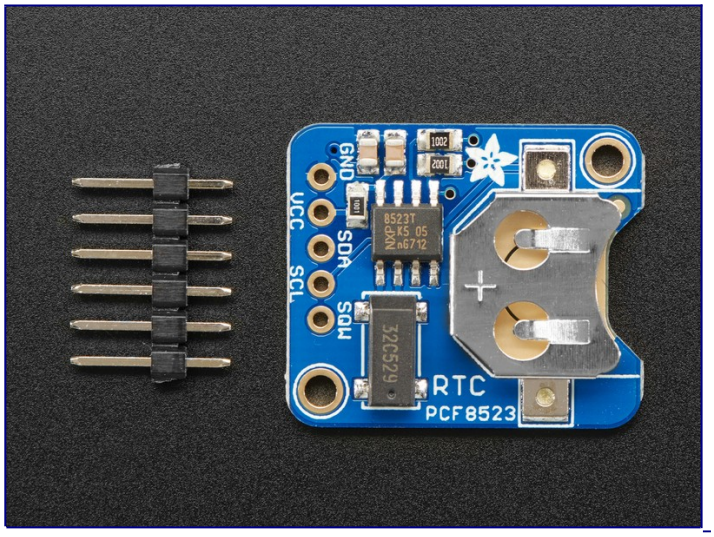

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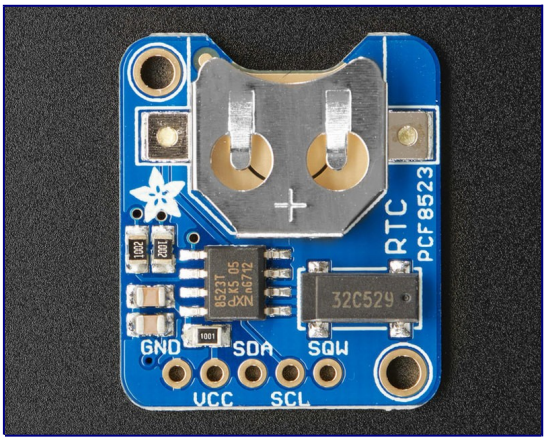
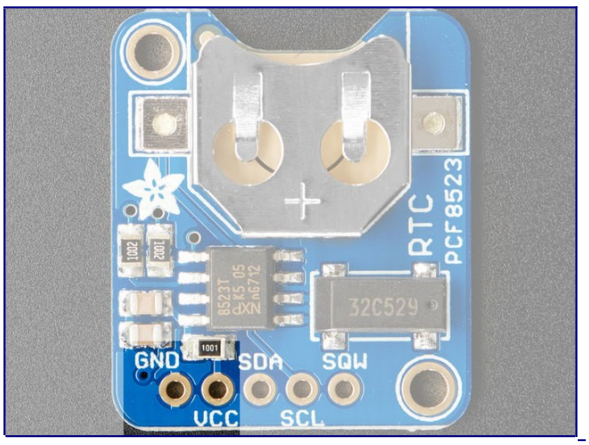
Pinouts



The PCF8523 is a I2C device. That means it uses the two I2C data/clock wires available on most microcontrollers, and can share those pins with other sensors as long as they don't have an address collision.

For future reference, the default I2C address is **0x68**. You *cannot* change it.

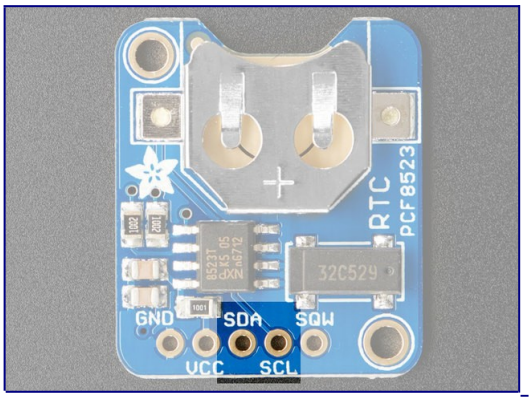
Power Pins:

- 

VCC - this is the power pin. This chip can be powered by 3-5VDC so there is now on-board regulator. To power the board, give it the same power as the logic level of your microcontroller - e.g. for a 5V micro like Arduino, use 5V

GND - common ground for power and logic

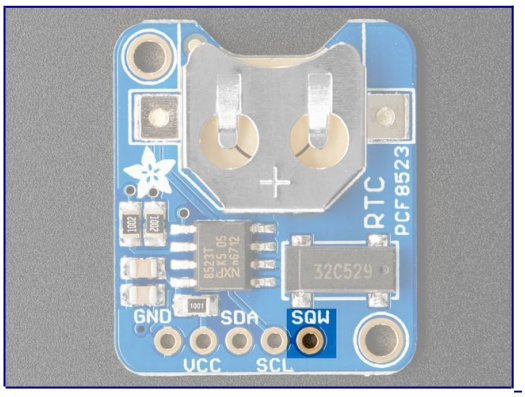
I2C Logic pins:

- 

SCL - I2C clock pin, connect to your microcontrollers I2C clock line.

SDA - I2C data pin, connect to your microcontrollers I2C data line.

Other Pins:

- 

The **SQW** pin is for square-wave output if you enable it

What is a Real Time Clock?

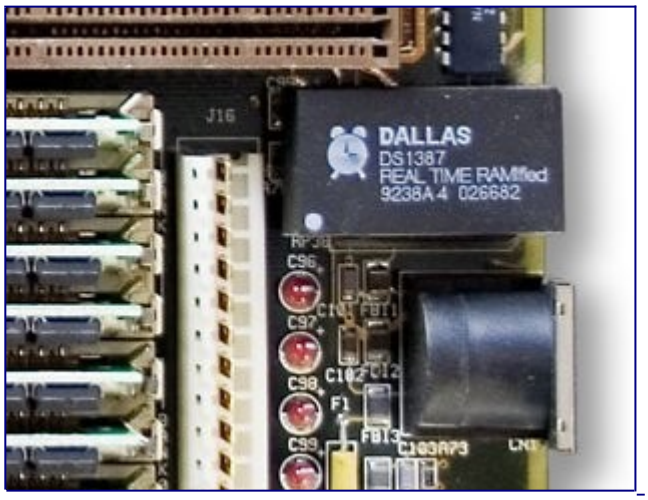
When logging data, it's often really really useful to have timestamps! That way you can take data one minute apart (by checking the clock) or noting at what time of day the data was logged.

The Arduino IDE does have a built-in timekeeper called **millis()** (CircuitPython has **time**) and theres' also timers built into the chip that can keep track of longer time periods like minutes or days. So why would you want to have a separate RTC chip? Well, the biggest reason is that **millis()/time** only keeps track of time *since the board was last powered* - that means that when the power is turned on, the millisecond timer is set back to 0. The board doesn't know its 'Tuesday' or 'March 8th' all it can tell is 'Its been 14,000 milliseconds since I was last turned on'.

OK so what if you wanted to set the time? You'd have to program in the date and time and you could have it count from that point on. But if it lost power, you'd have to reset the time. Much like very cheap alarm clocks: every time they lose power they blink **12:00**

While this sort of basic timekeeping is OK for some projects, a data-logger will need to have **consistent timekeeping that doesnt reset when the power goes out or is reprogrammed**. Thus, we include a separate RTC! The RTC chip is a specialized chip that just keeps track of time. It can

count leap-years and knows how many days are in a month, but it doesn't take care of Daylight Savings Time (because it changes from place to place)



This image shows a computer motherboard with a Real Time Clock called the DS1387. Theres a lithium battery in there which is why it's so big.

The RTC we'll be using is the *PCF8523*

Battery Backup

As long as it has a coin cell to run it, the RTC will merrily tick along for a long time, even when the Feather loses power, or is reprogrammed.

Use any CR1220 3V lithium metal coin cell battery:

CR1220 12mm Diameter - 3V Lithium Coin Cell Battery

PRODUCT ID: 380
These are the highest quality & capacity batteries, the same as shipped with the iCufflinks, iNecklace, Datalogging and GPS Shields, GPS HAT, etc. One battery per order...

RTC with Arduino

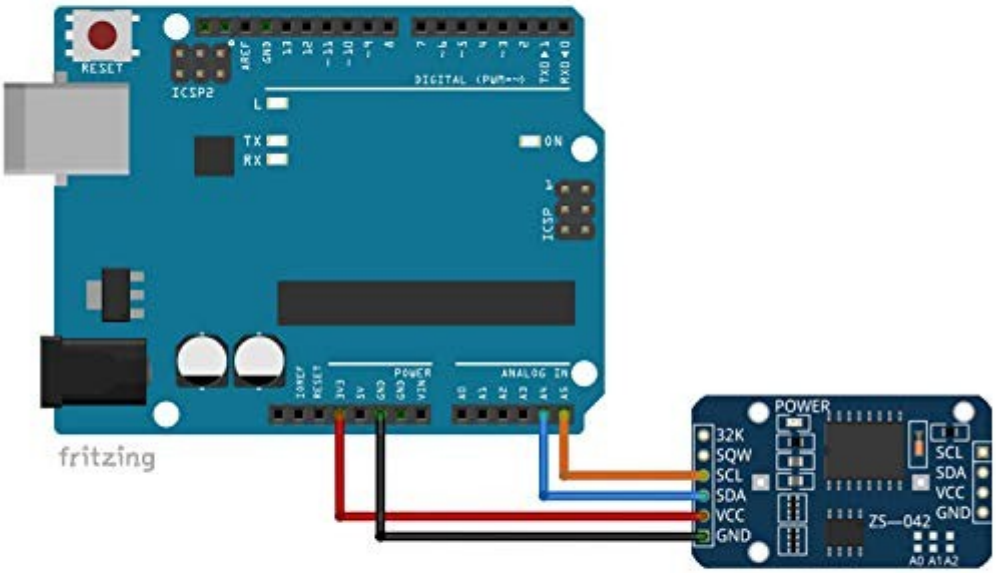
Wiring

Wiring it up is easy, connect

- **GND** to **GND** on your board
- **VCC** to the logic level power of your board (on classic Arduinos & Metros use 5V, on 3.3V devices use 3.3V)

- **SDA** to the **SDA** i2c data pin
- **SCL** to the **SCL** i2c clock pin

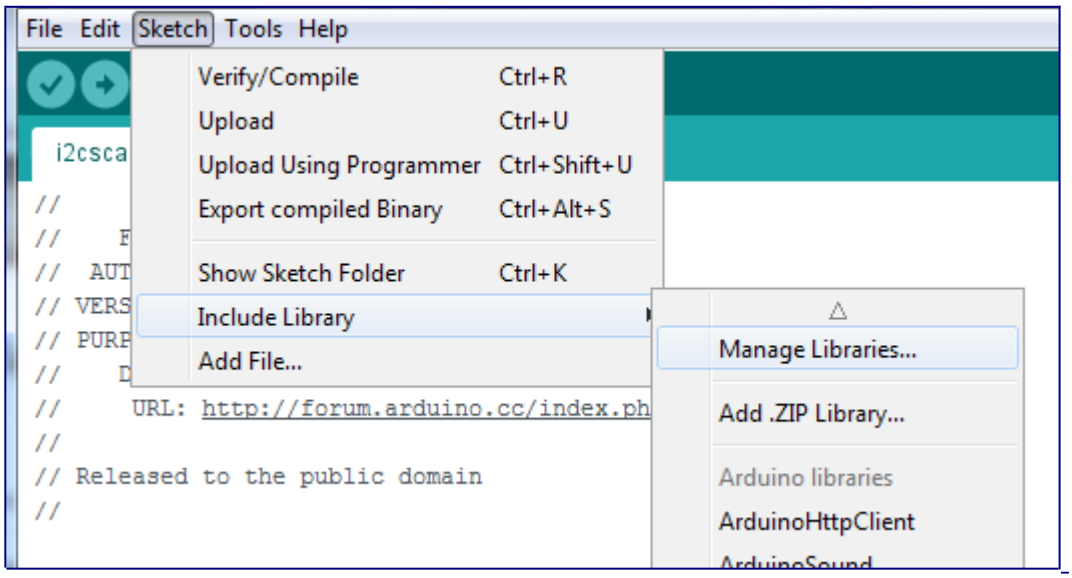
There are internal 10K pull-ups on the PCF8523 on SDA and SCL to the VCC voltage



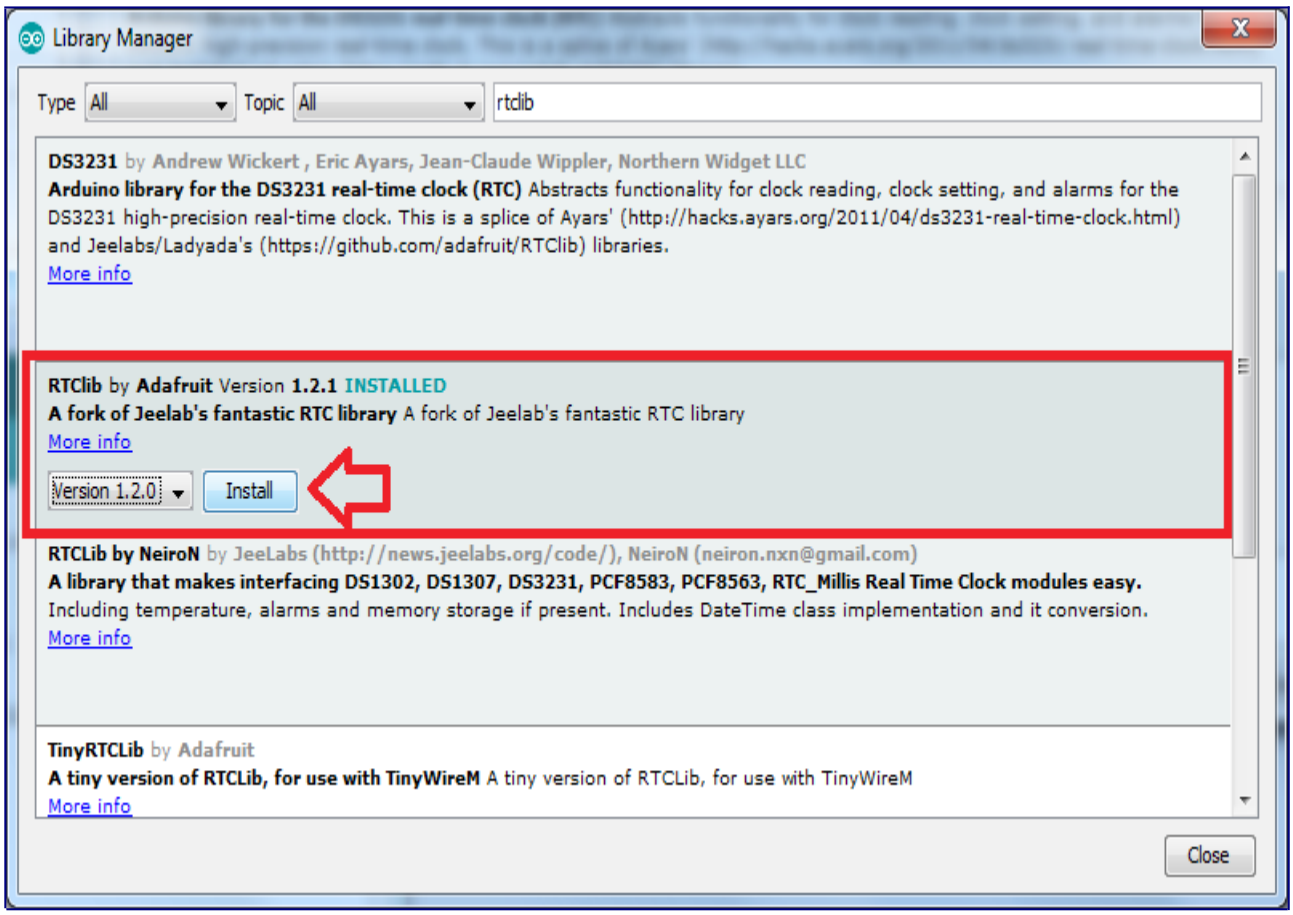
Talking to the RTC

The RTC is an i2c device, which means it uses 2 wires to to communicate. These two wires are used to set the time and retrieve it.

For the RTC library, we'll be using a fork of JeeLab's excellent RTC library**,** [which is available on GitHub](). You can do that by visiting the github repo and manually downloading or, easier go to the **Arduino Library Manager**



Type in **RTClib** - and find the one that is by **Adafruit** and click **Install**



There are a few different 'forks' of RTClib, make sure you are using the ADAFRUIT one!

We also have a great tutorial on Arduino library installation at:
http://learn.adafruit.com/adafruit-all-about-arduino-libraries-install-use

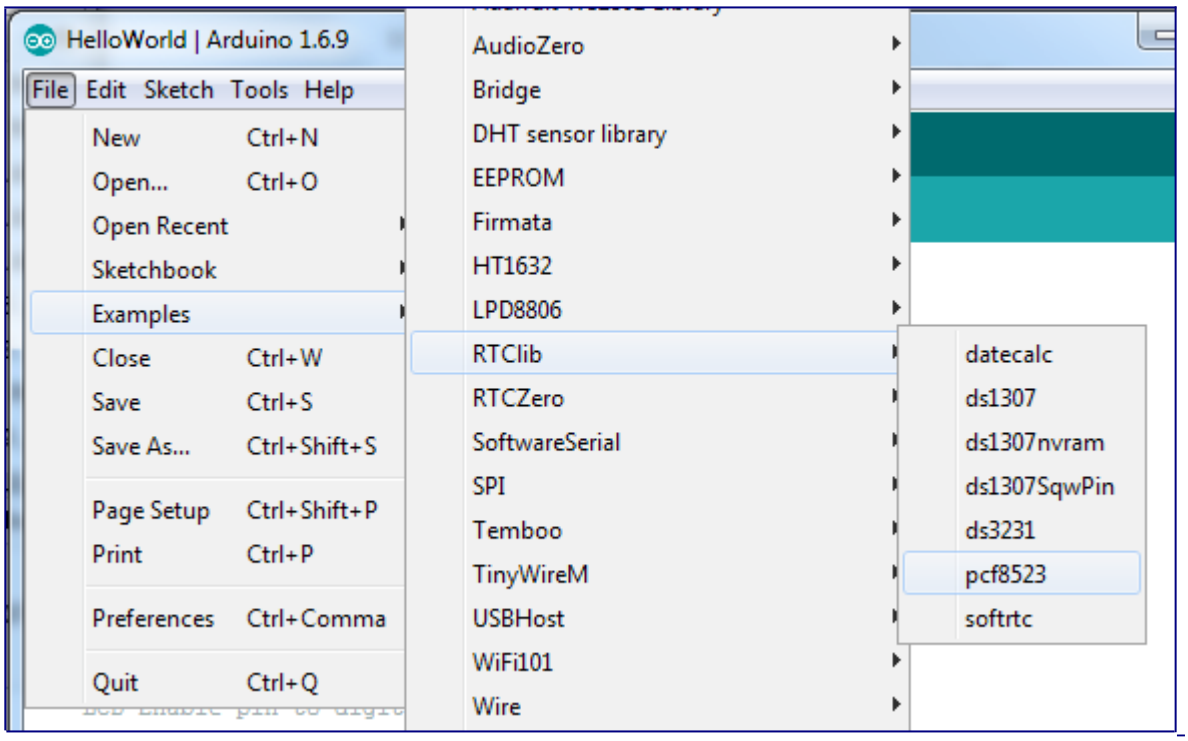
Once done, restart the IDE

First RTC test

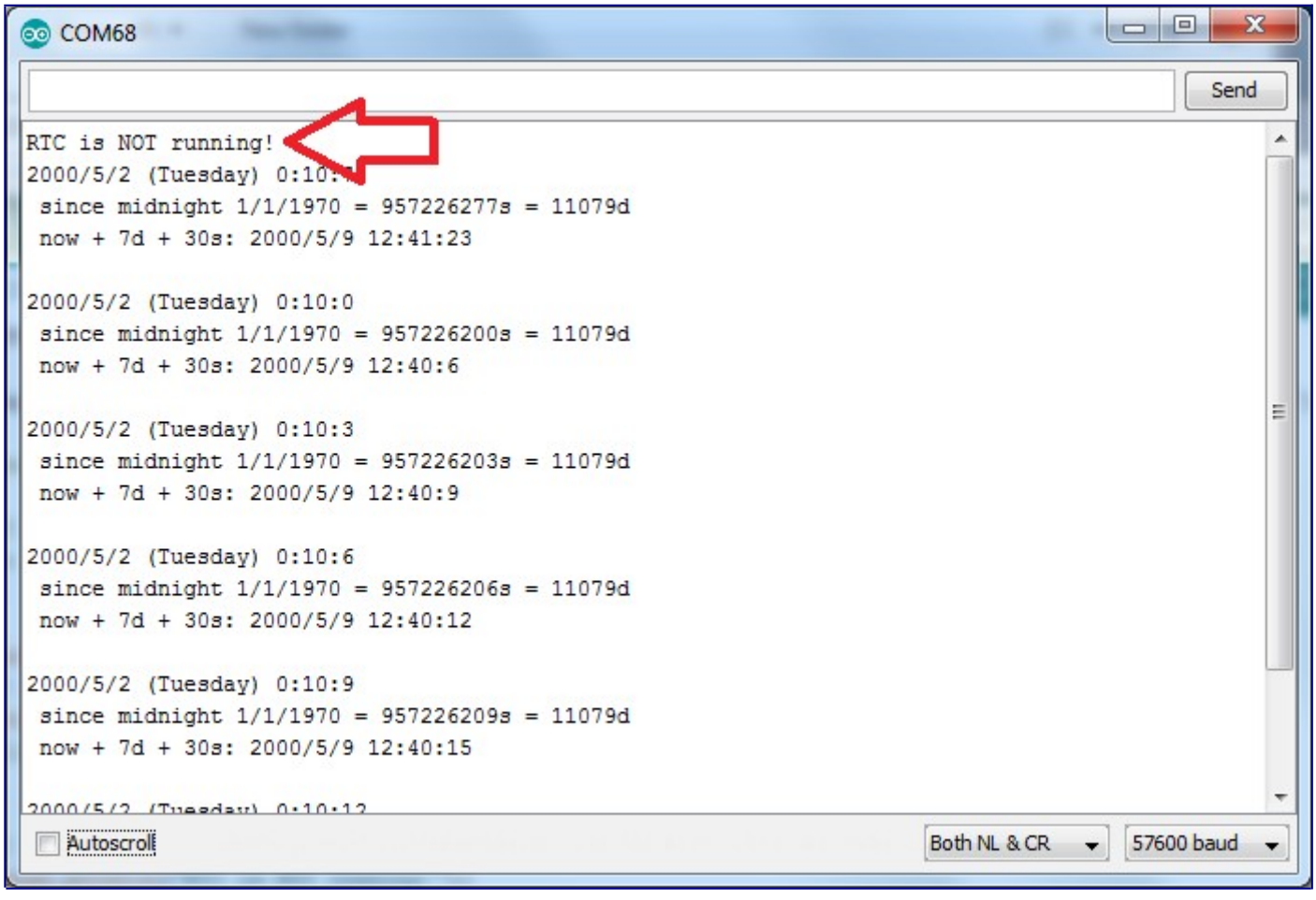
The first thing we'll demonstrate is a test sketch that will read the time from the RTC once a second. We'll also show what happens if you remove the battery and replace it since that causes the RTC to halt. So to start, remove the battery from the holder while the Feather is not powered or plugged into USB. Wait 3 seconds and then replace the battery. This resets the RTC chip. Now load up the matching sketch for your RTC

Open up **Examples->RTClib->pcf8523**

Upload it to your board *with the PCF8523 breakout board or FeatherWing connected*



Now open up the Serial Console and make sure the baud rate is set correctly at **57600 baud** you should see the following:



Whenever the RTC chip loses all power (including the backup battery) it will reset to an earlier date and report the time as 0:0:0 or similar. Whenever you set the time, this will kickstart the clock ticking.

So, basically, the upshot here is that you should never ever remove the battery once you've set the time. You shouldn't have to and the battery holder is very snug so unless the board is crushed, the battery won't 'fall out'

Setting the time

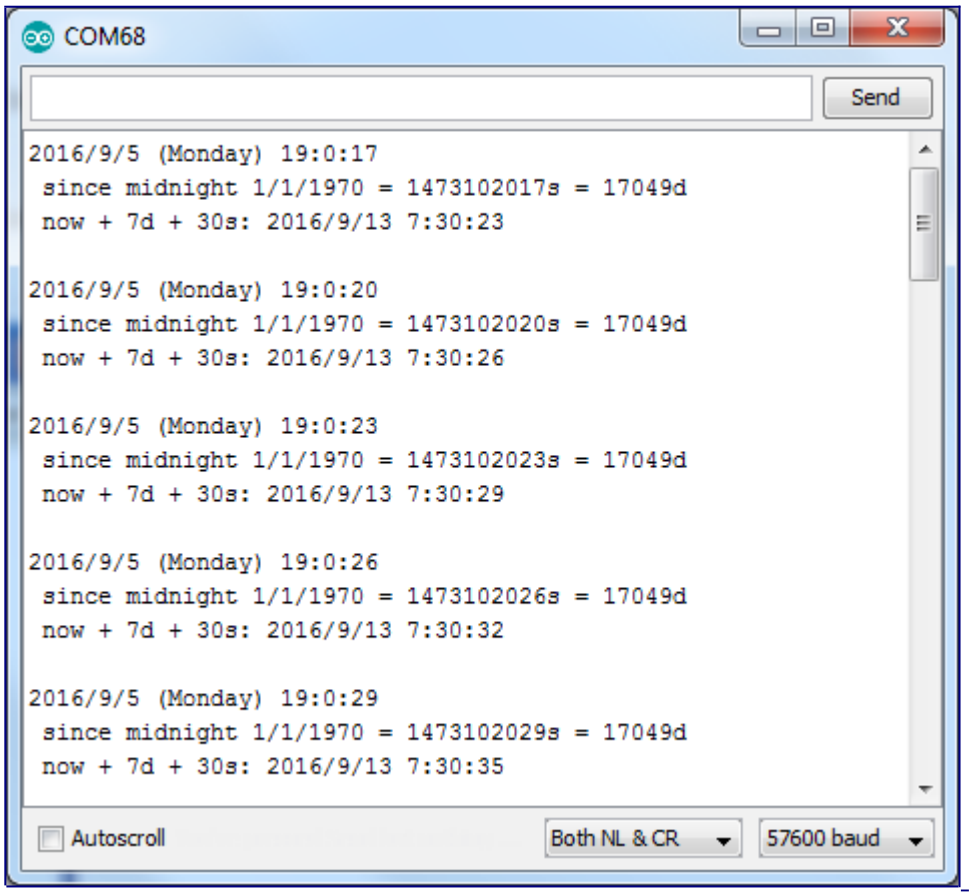
With the same sketch loaded, uncomment the line that starts with **RTC.adjust** like so:

Download: file
Copy Code

```
  if (! rtc.initialized()) {    Serial.println("RTC is NOT running!");    //
following line sets the RTC to the date & time this sketch was compiled
rtc.adjust(DateTime(F(__DATE__), F(__TIME__)));
```

This line is very cute, what it does is take the Date and Time according the computer you're using (right when you compile the code) and uses that to program the RTC. If your computer time is not set right you should fix that first. Then you must press the **Upload** button to compile and then immediately upload. If you compile and then upload later, the clock will be off by that amount of time.

Then open up the Serial monitor window to show that the time has been set



From now on, you won't have to ever set the time again: the battery will last 5 or more years

Reading the time

Now that the RTC is merrily ticking away, we'll want to query it for the time. Let's look at the sketch again to see how this is done

```
void loop () {

DateTime now = rtc.now();

Serial.print(now.year(), DEC);

Serial.print('/');

Serial.print(now.month(), DEC);

Serial.print('/');

Serial.print(now.day(), DEC);

Serial.print(" (");

Serial.print(daysOfTheWeek[now.dayOfTheWeek()]);

Serial.print(") ");

Serial.print(now.hour(), DEC);

Serial.print(':');

Serial.print(now.minute(), DEC);

Serial.print(':');

Serial.print(now.second(), DEC);

Serial.println();
```

There's pretty much only one way to get the time using the RTClib, which is to call **now()**, a function that returns a DateTime object that describes the year, month, day, hour, minute and second when you called **now()**.

There are some RTC libraries that instead have you call something like **RTC.year()** and **RTC.hour()** to get the current year and hour. However, there's one problem where if you happen to ask for the minute right at **3:14:59** just before the next minute rolls over, and then the second right after the minute rolls over (so at **3:15:00**) you'll see the time as **3:14:00** which is a minute off. If you did it the other way around you could get **3:15:59** - so one minute off in the other direction.

Because this is not an especially unlikely occurance - particularly if you're querying the time pretty often - we take a 'snapshot' of the time from the RTC all at once and then we can pull it apart into

day() or **second()** as seen above. It's a tiny bit more effort but we think its worth it to avoid mistakes!

We can also get a 'timestamp' out of the DateTime object by calling **unixtime** which counts the number of seconds (not counting leapseconds) since midnight, January 1st 1970

```
Serial.print(" since 2000 = ");

Serial.print(now.unixtime());

Serial.print("s = ");

Serial.print(now.unixtime() / 86400L);

Serial.println("d");
```

Since there are 60*60*24 = 86400 seconds in a day, we can easily count days since then as well. This might be useful when you want to keep track of how much time has passed since the last query, making some math a lot easier (like checking if it's been 5 minutes later, just see if **unixtime()** has increased by 300, you dont have to worry about hour changes)