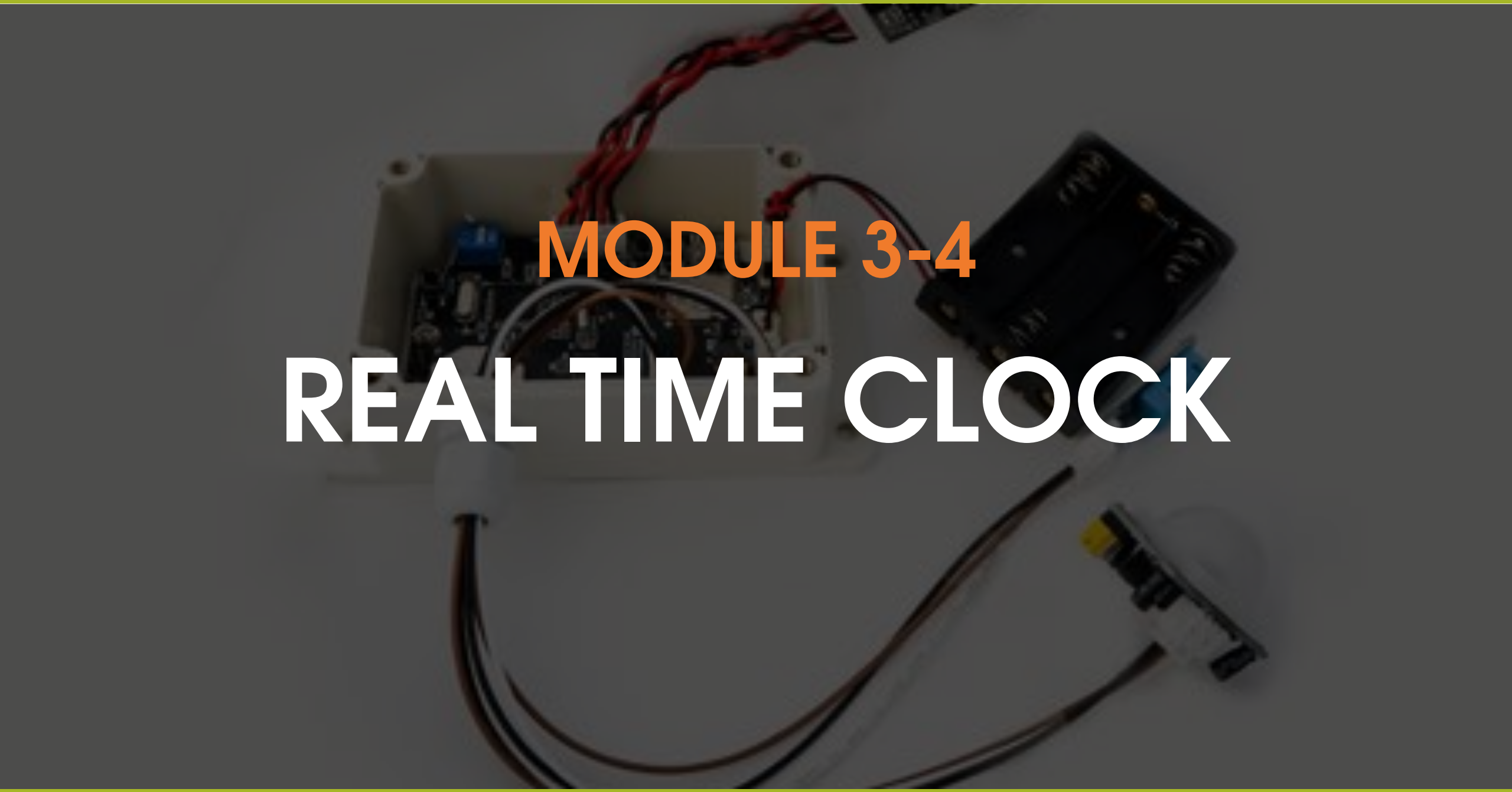


MODULE 3-4

REAL TIME CLOCK

Introduction – Real Time Clock

An RTC is an electronic time keeping device with its own battery. It's often used in other devices such as a data logger.

Purpose:

- Timestamping
- Event management (helps with power saving)

Features

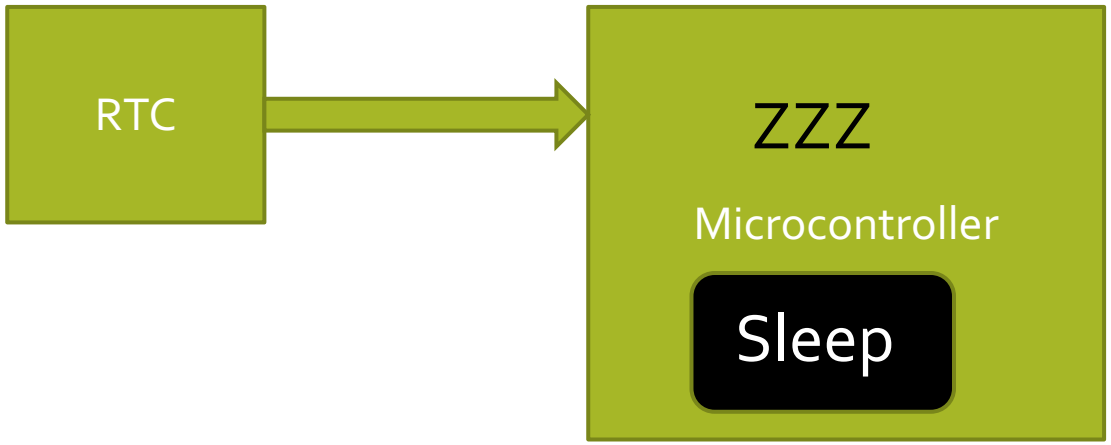
- Has its own battery
- Keeps time even when the main device is powered off or the batteries are dead

Introduction – Real Time Clock

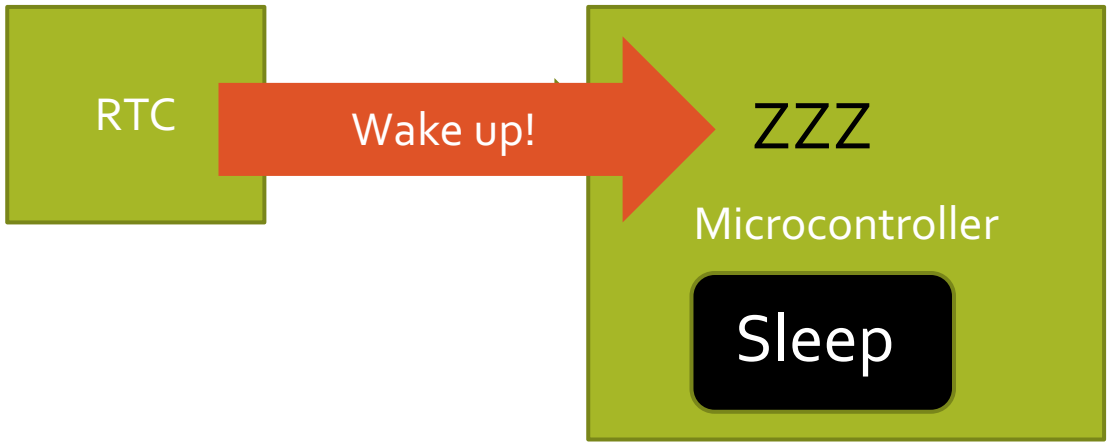
Event management (helps with power saving)

- Alarm
- Timer

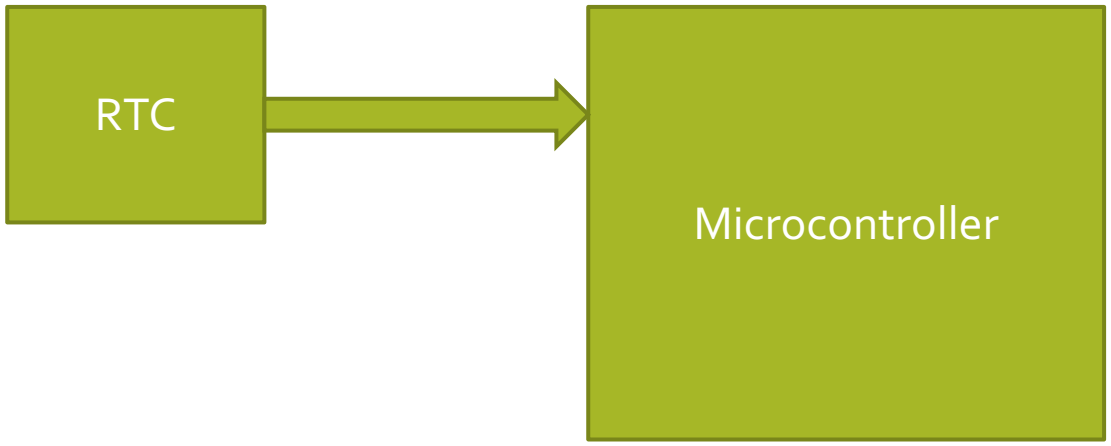
Real Time Clock - Alarm/Timer



Real Time Clock - Alarm/Timer

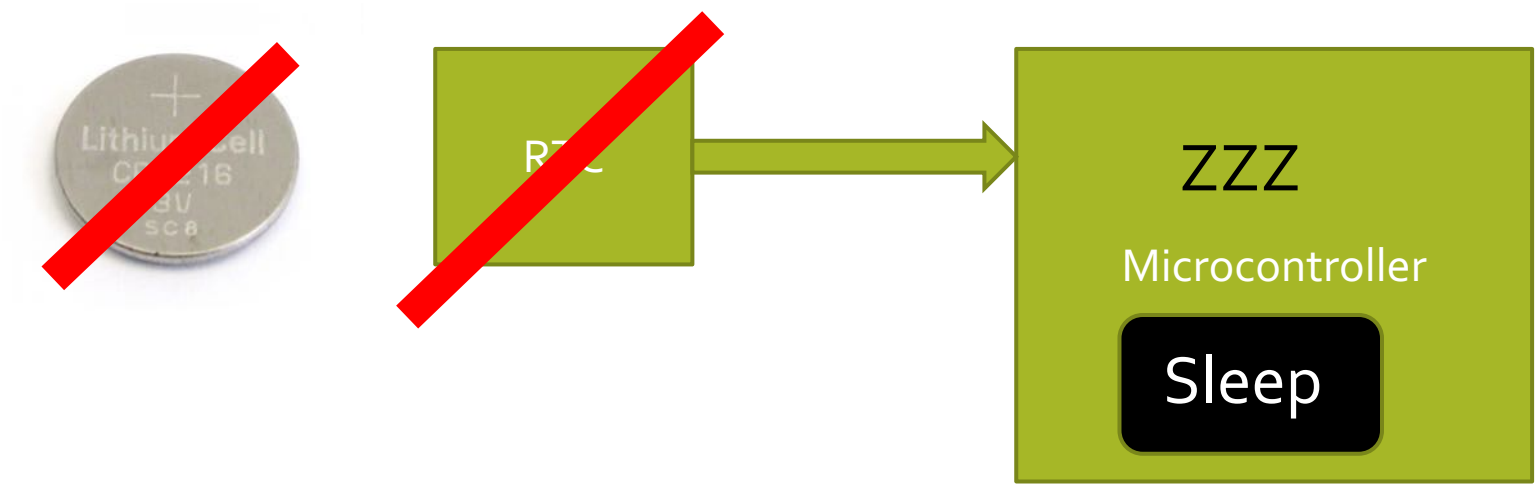


Real Time Clock - Alarm/Timer



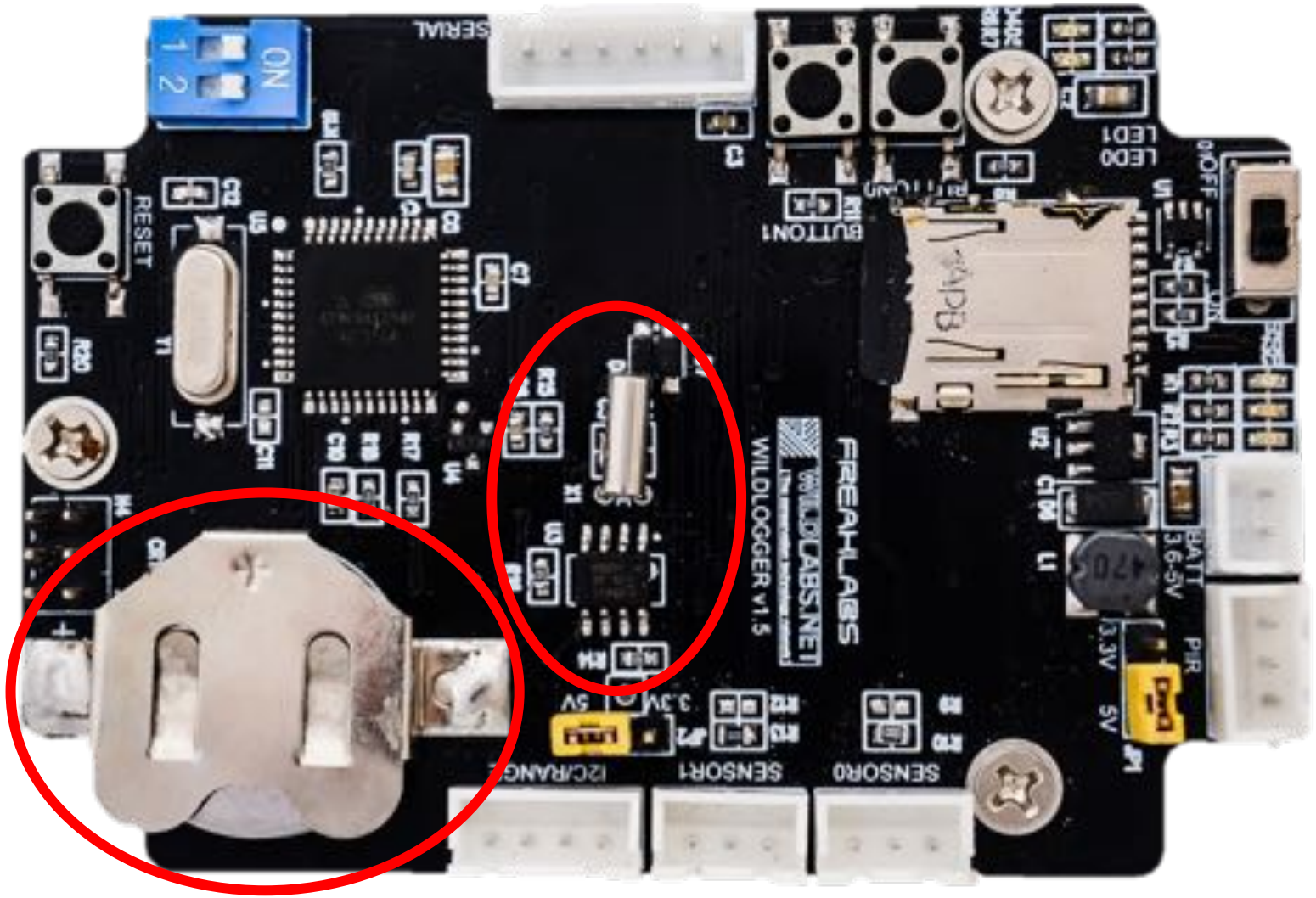
- Read Sensors
- Read Date/Time
- Write to SD

Real Time Clock - Alarm/Timer

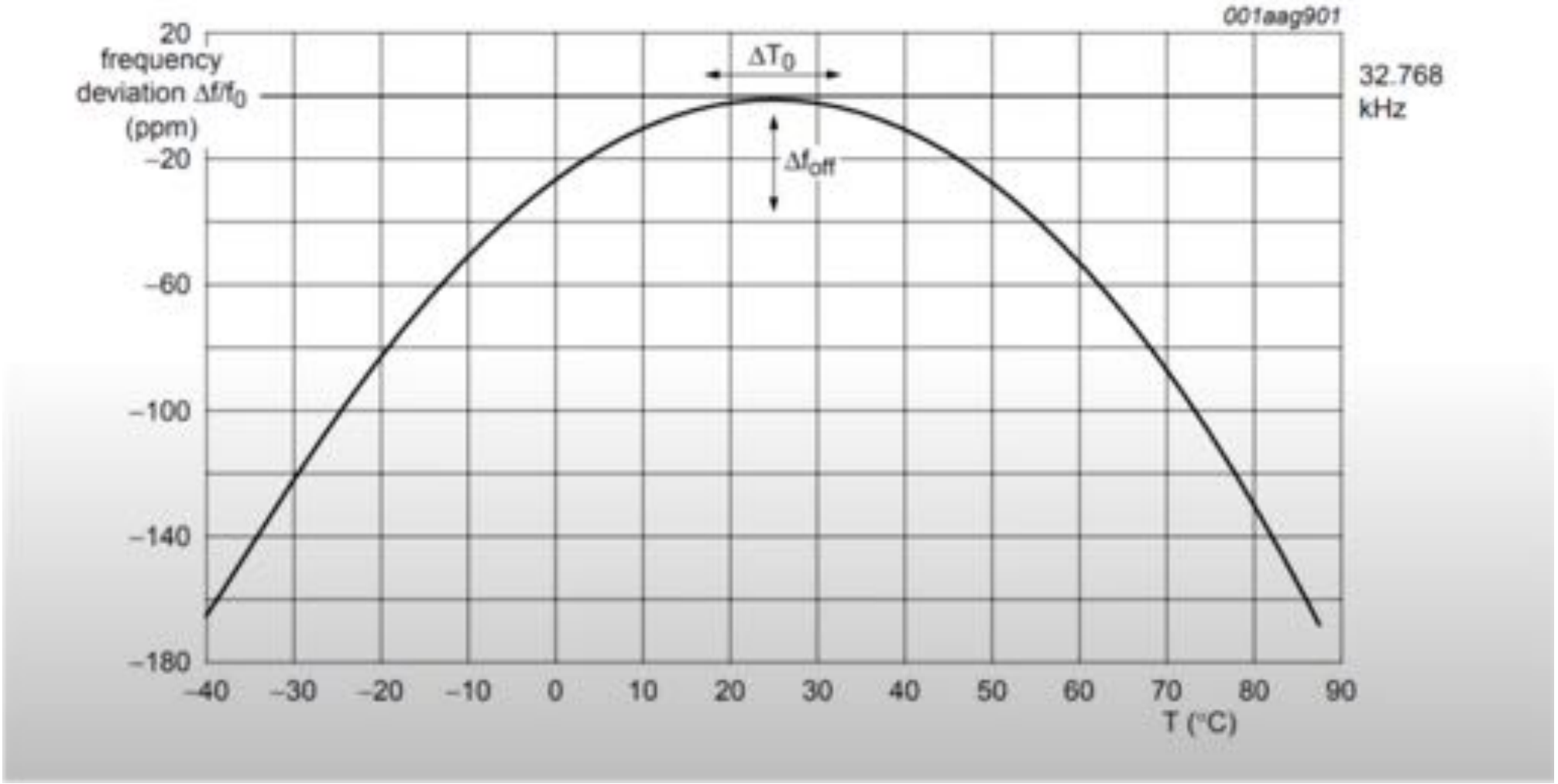


Catastrophic Failure!

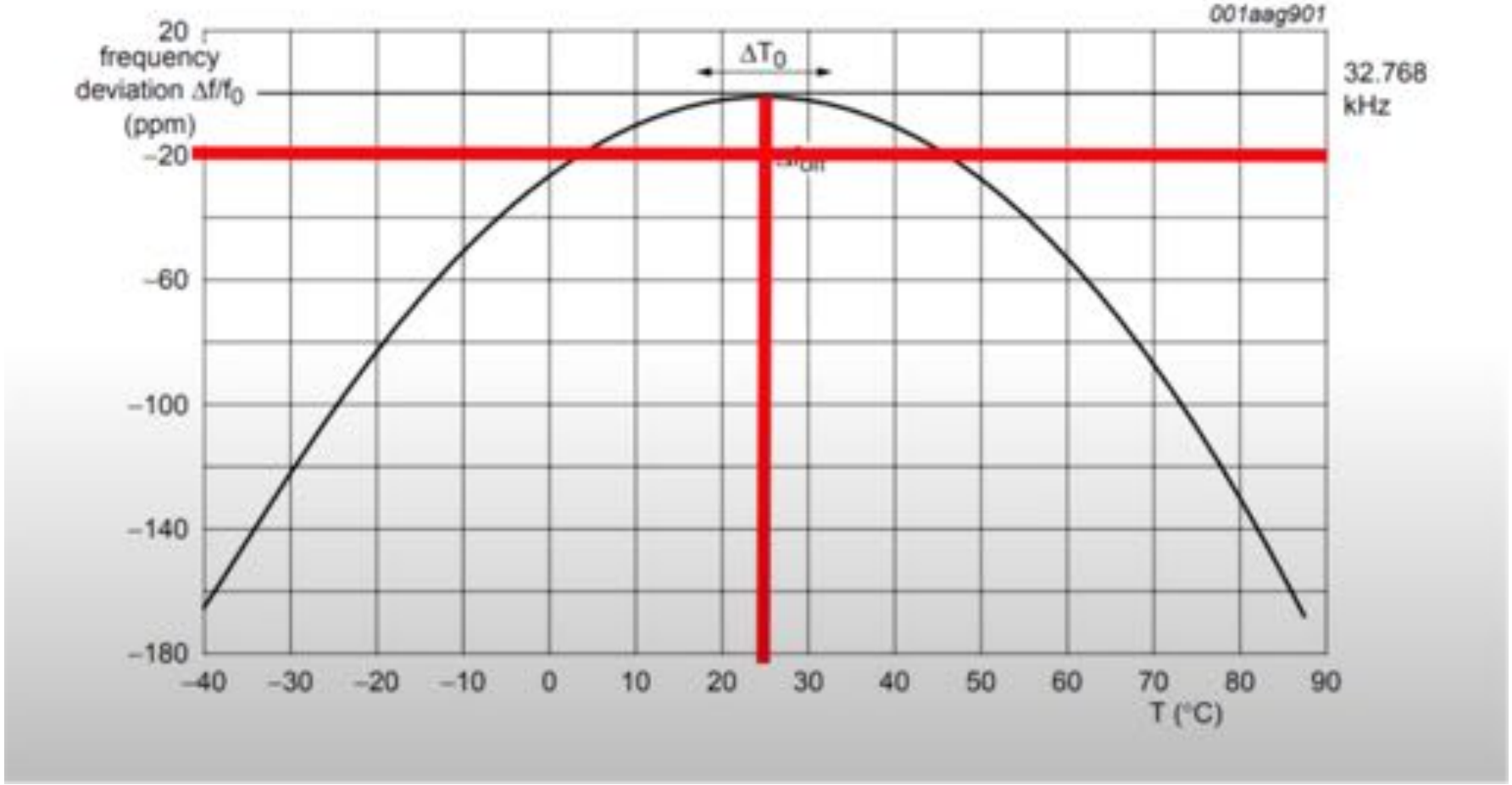
WildLogger – Real Time Clock



Real Time Clock - Accuracy



Real Time Clock - Accuracy

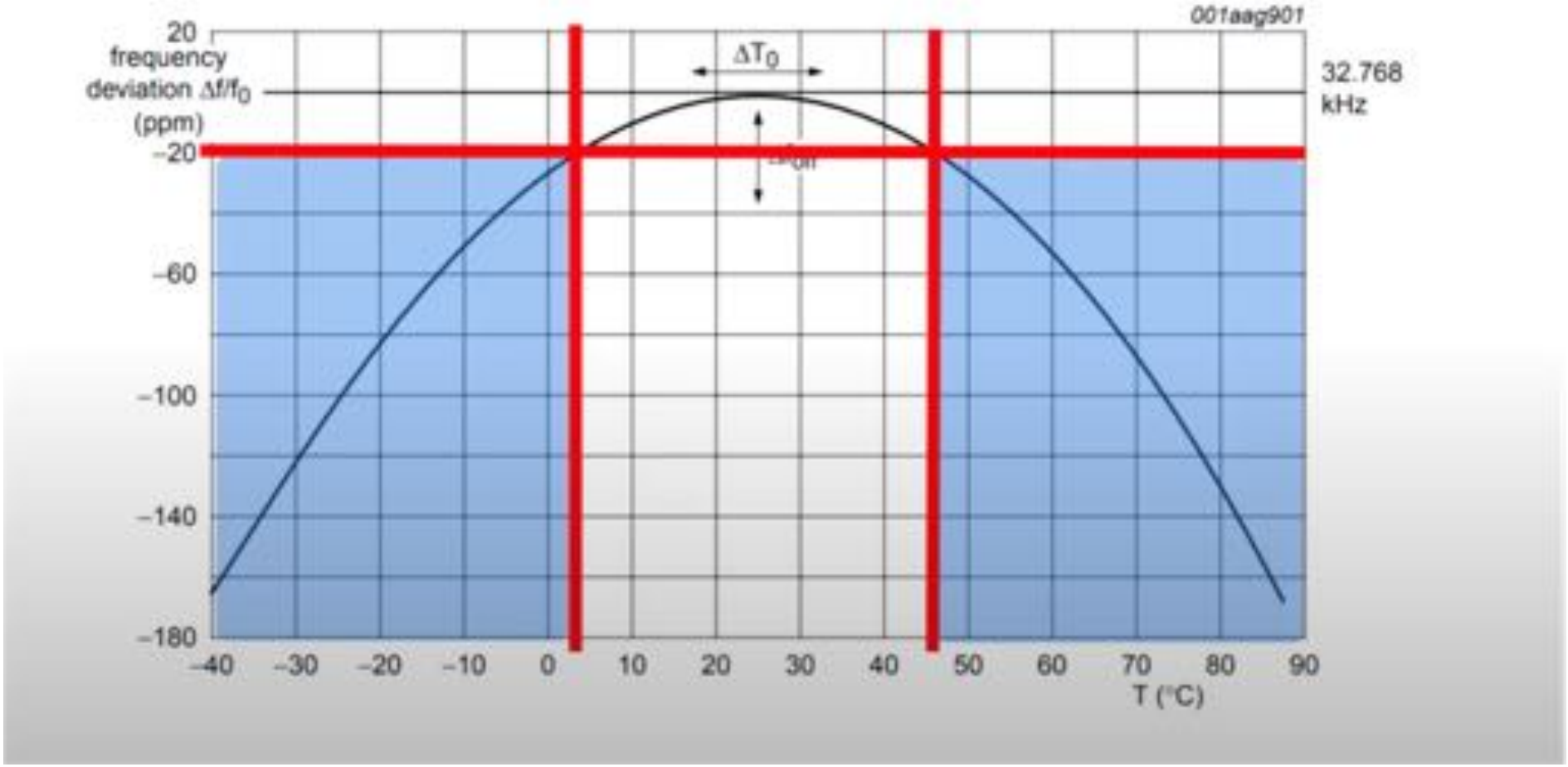


10 ppm = loses 0.5 min per month (approx)

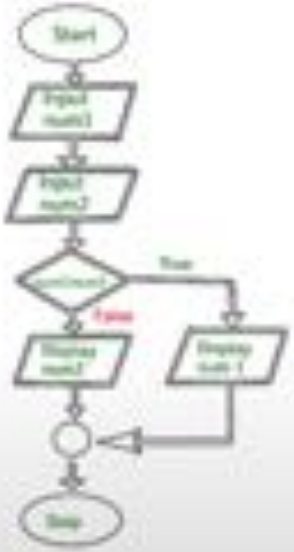
20 ppm = loses 1 min per month (approx)

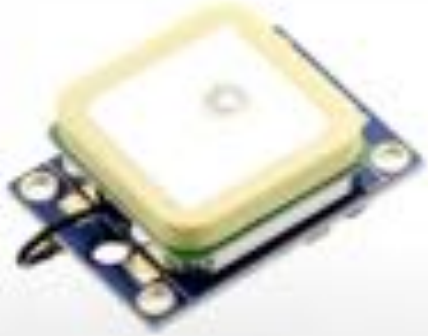
40 ppm = loses 2 min per month (approx)

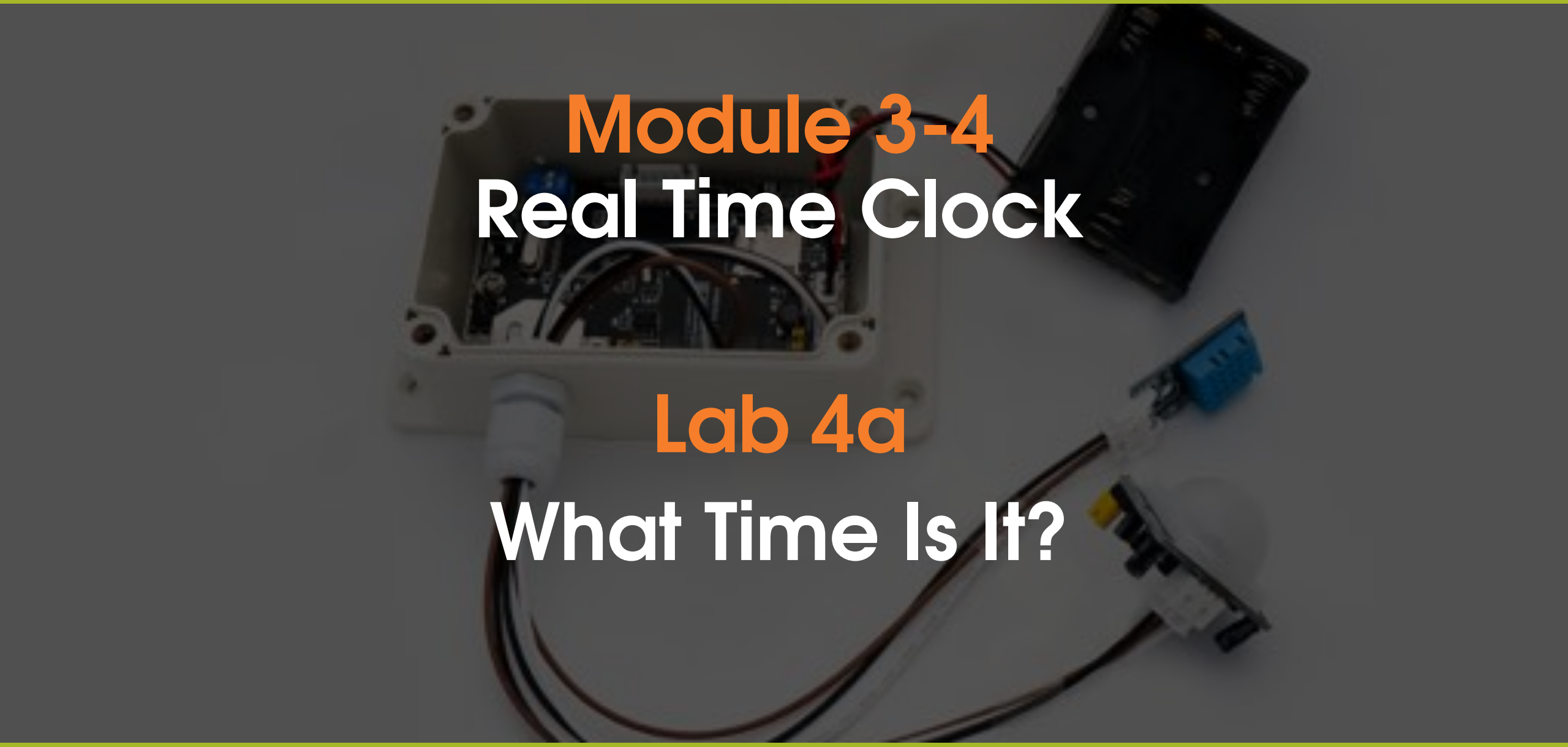
Real Time Clock - Accuracy



Real Time Clock Accuracy







Module 3-4
Real Time Clock

Lab 4a
What Time Is It?

Lab 4a – What Time Is It?

Goal:

- Install real time clock library
- Set time and date
- Read time and date

Lab 4a – What Time Is It?

Why do I need to know this?

- Timekeeping will be critical to the WildLogger functionality
- Reading time will be used to timestamp data
- Timekeeping useful in many other applications, esp. low power ones

Lab 4a – What Time Is It?

What do I need to know?

- Install PCF8563 real time clock library manually
- **Rtc_Pcf8563 rtc**
  - Creates a real time clock (RTC) object
- **rtc.setDate(day, weekday, month, century, year);**
  - We can set century to 0 for 20xx
- **rtc.setTime(hour, minute, second)**
  - Note: hour is in 24-hour format

Lab 4a – What Time Is It?

- **getWeekday(), getDay(), getMonth(), getYear()**
  - Gets the numerical (integer) value for each
- **getSecond(), getMinute(), getHour()**
  - Gets the numerical (integer) value for each
- **char *rtc.formatDate(format)**
  - Returns the date in a pre-formatted string mm/dd/yyyy
  - Can change format also:
    - RTCC_DATE_CZ - dd.mm.yyyy
    - **RTCC_DATE_ASIA - yyyy-mm-dd (what we'll use)**
    - RTCC_DATE_WORLD - dd-mm-yyyy
    - RTCC_DATE_US – mm/dd/yyyy (default)
- **char *rtc.formatTime()**
  - Returns the time in a pre-formatted string hh:mm:ss

Lab 4a – What Time Is It?

- **rtc.setDate(day, weekday, month, century, year);**

Week Day	Sunday = 0 Monday = 1 Tuesday = 2 Wednesday = 3 Thursday = 4 Friday = 5 Saturday = 6
Day of the month	As per calendar day (1 – 31)
Month of the year	As per calendar month (1-12)
Century	0 = 2000 1 = 1900
Year	Last two digits of calendar year (0-99)

Lab 4a – What Time Is It?

- **rtc.setTime(hour, minute, second)**

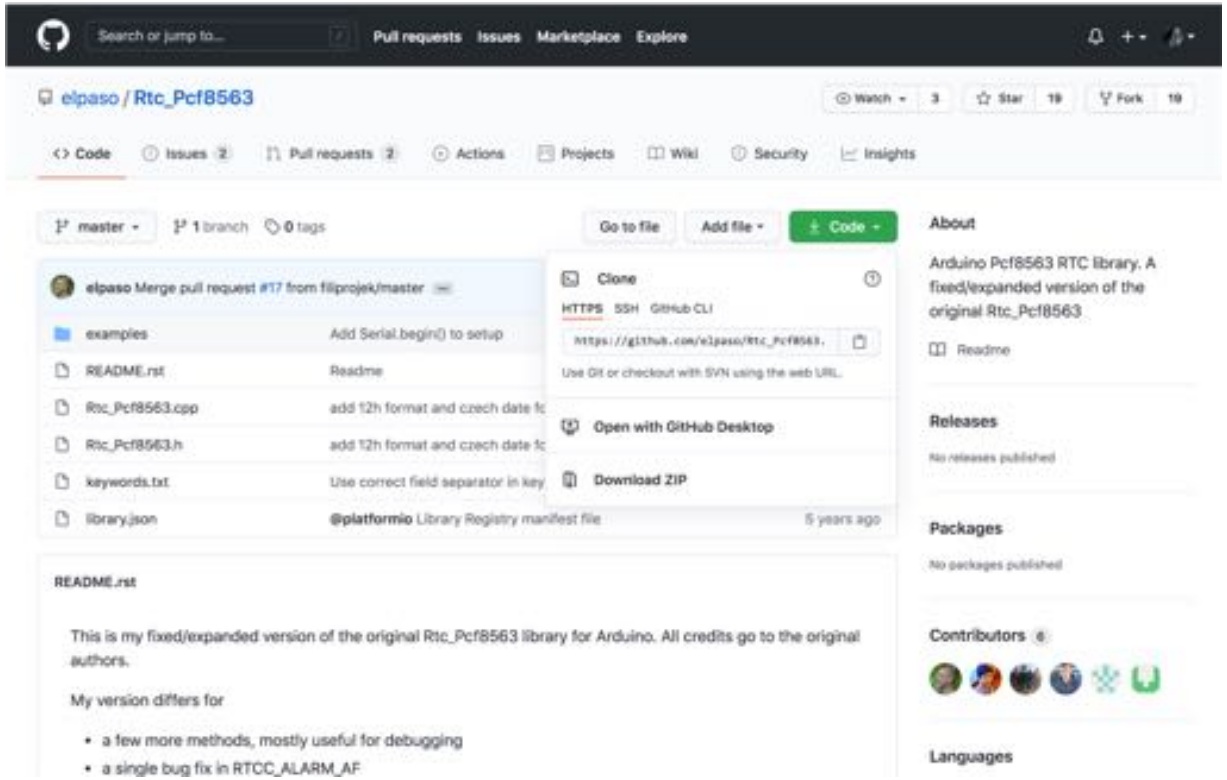
Hours (oo), minutes(oo), seconds(oo)
eg. 12:34:21

24 hours
12am = 00
1am = 01
2am = 02
3 am = 03 etc

12 noon = 12
1pm = 13
2pm = 14
3pm = 15 etc

Manually Installing an Arduino Library

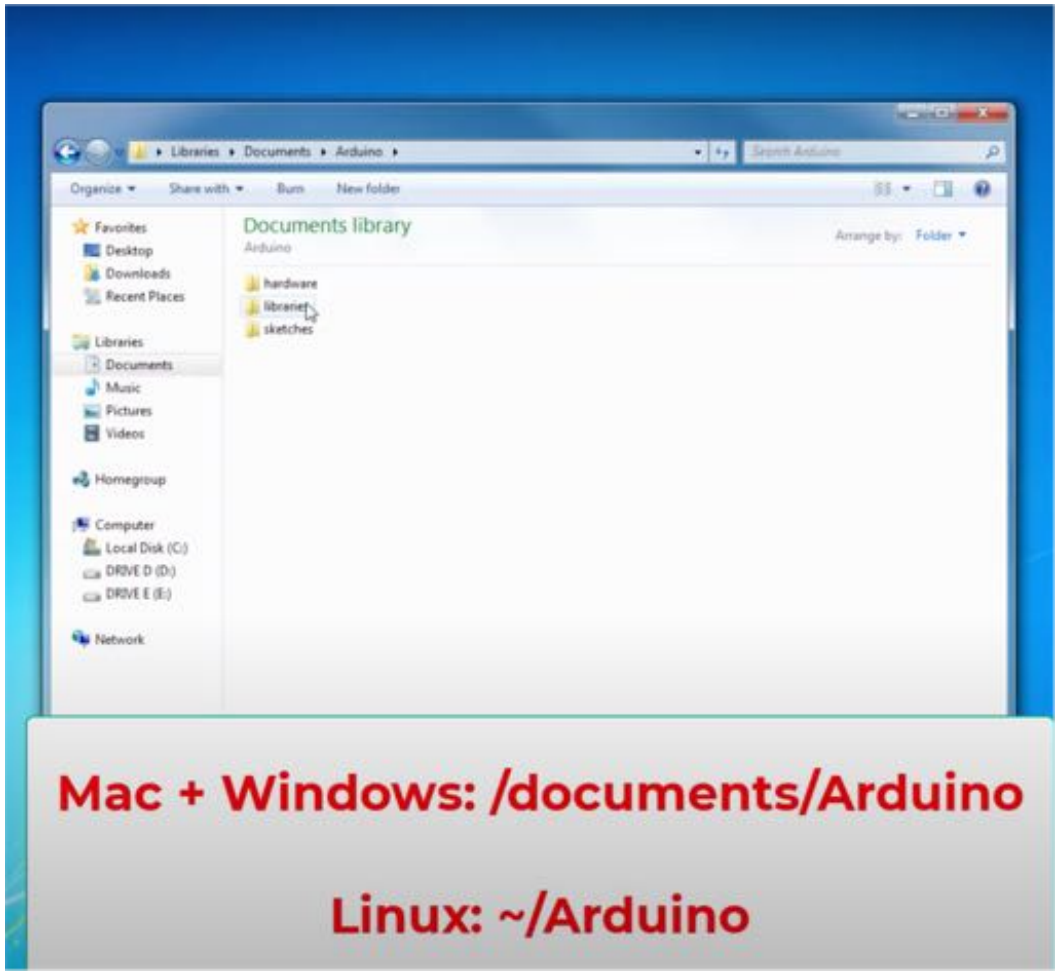
https://github.com/elpaso/Rtc_Pcf8563



Manually Installing an Arduino Library

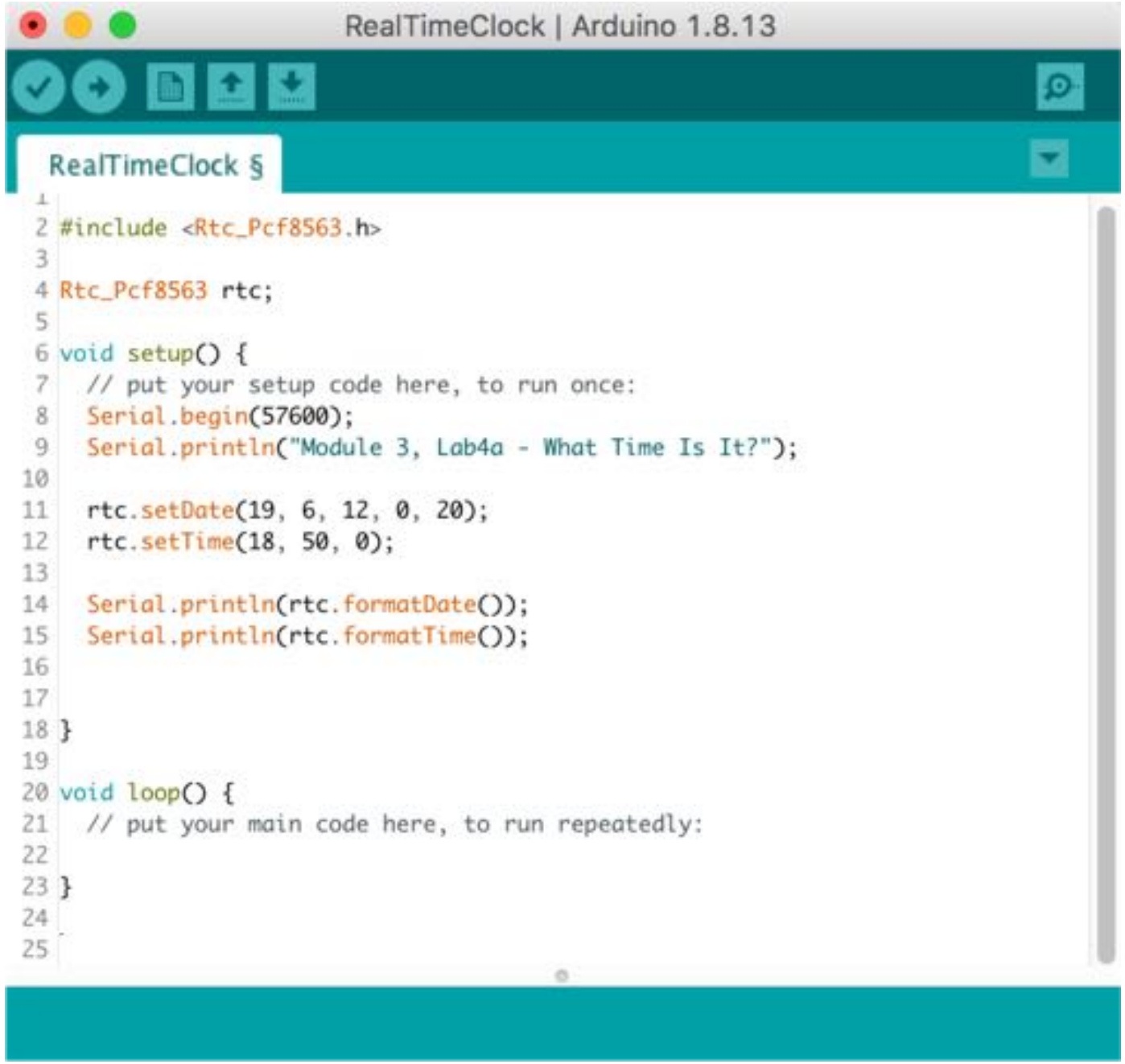
/Documents/Arduino/libraries

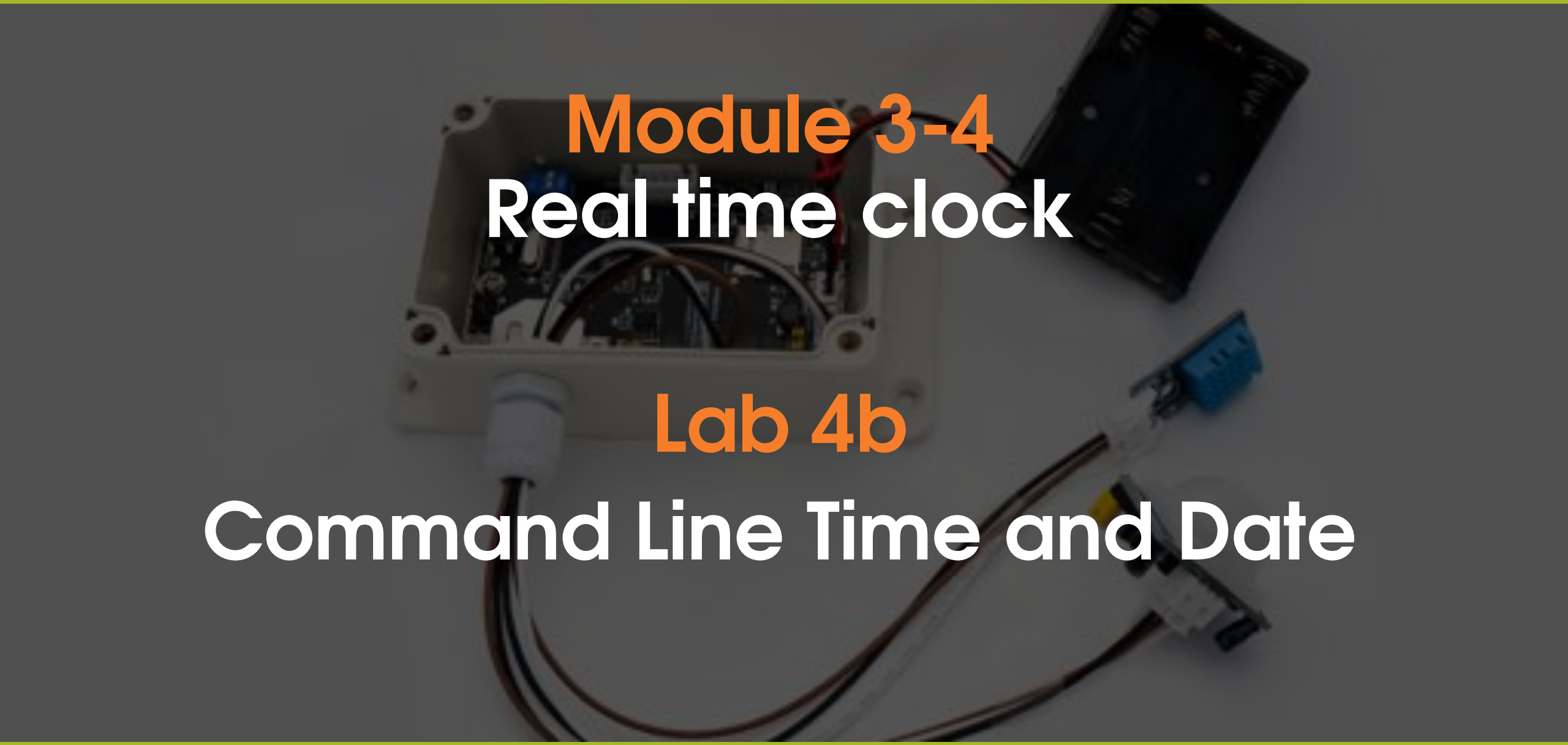
~ /Arduino/libraries



Lab 4a

Real Time Clock





Module 3-4
Real time clock

Lab 4b
Command Line Time and Date

Lab 4b – Command Line Time

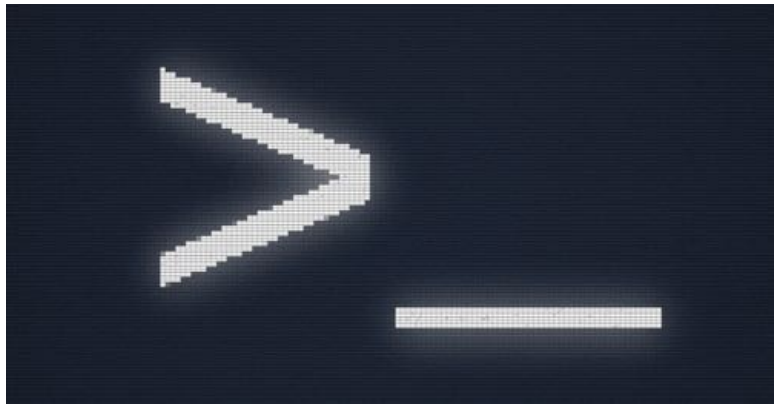
Goal:

- Create a command that sets the time
- Create a command that sets the date
- Create a command that prints out the time
- Create a command that prints out the date

Lab 4b – Command Line Time

Why do I need to know this?

- Extremely useful to have a command to set time and date. Usually just done once before deployment
- Test out our time and date format as a timestamp



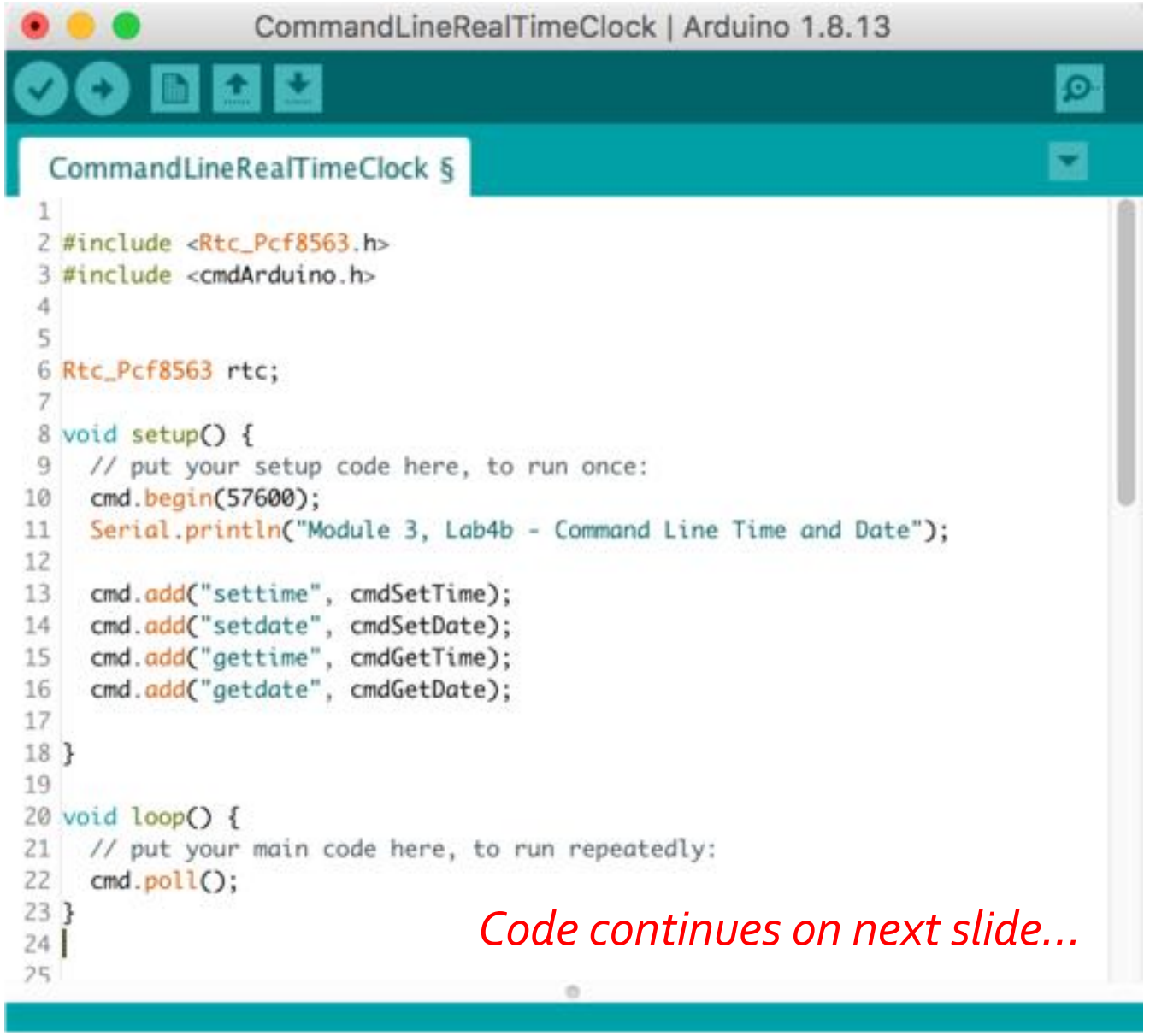
Lab 4b – Command Line Time

What do I need to know?

Lab 4b

Command Line Time and Date

Code continues on next slide…



Lab 4b

Command Line Time and Date

This code goes after the loop function…


```
25 void cmdSetTime(int argCnt, char **args)
26 {
27   int hour = cmd.conv(args[1]);
28   int minute = cmd.conv(args[2]);
29   int second = cmd.conv(args[3]);
30
31   rtc.setTime(hour, minute, second);
32   Serial.println(rtc.formatTime());
33
34 }
35
36 void cmdSetDate(int argCnt, char **args)
37 {
38   int year = cmd.conv(args[1]);
39   int month = cmd.conv(args[2]);
40   int day = cmd.conv(args[3]);
41   int weekday = cmd.conv(args[4]);
42
43   rtc.setDate(day, weekday, month, 0, year);
44   Serial.println(rtc.formatDate());
45 }
46
47
48 void cmdGetTime(int argCnt, char **args)
49 {
50   Serial.println(rtc.formatTime());
51 }
52
53 void cmdGetDate(int argCnt, char **args)
54 {
55
56   Serial.println(rtc.formatDate());
57 }
58
```