Installing an Arduino Library a learn.sparkfun.com tutorial

Available online at: http://sfe.io/t15

Contents

What's a Library?

Arduino libraries take a complex task and boil it down to simple to use functions. Arduino users have written lots of exciting add-ons for Arduino. For example, capacitive sensing takes difficult timing and pulsing of digital pins. We can write the code from scratch, or we can stand on the shoulders of great people who are smarter than we are.

Capacitive touch sensing is a very popular interface. TheCapacitiveSensor library takes care of everything so that we don't have to write code like this:

```
language:c
*sOut &= ~sBit;       // set Send Pin Register low
*rReg &= ~rBit;       // set receivePin to input
*rOut &= ~rBit;       // set receivePin Register low to make sure pullups are off
*rReg |= rBit;        // set pin to OUTPUT - pin is now LOW AND OUTPUT
*rReg &= ~rBit;       // set pin to INPUT
*sOut |= sBit;        // set send Pin High
interrupts();         // enable interrupts

while ( !(*rIn & rBit)  && (total < CS_Timeout_Millis) ) {
    total++;
}

if (total > CS_Timeout_Millis)
    return -2;        //  total variable over timeout

// set receive pin HIGH briefly to charge up fully
noInterrupts();       // disable interrupts
*rOut  |= rBit;       // set receive pin HIGH - turns on pullup
*rReg |= rBit;        // set pin to OUTPUT - pin is now HIGH AND OUTPUT
*rReg &= ~rBit;       // set pin to INPUT
*rOut  &= ~rBit;      // turn off pullup
*sOut &= ~sBit;       // set send Pin LOW
interrupts();         // re-enable interrupts

while ( (*rIn & rBit) && (total < CS_Timeout_Millis) ) {
    total++;
}

if (total >= CS_Timeout_Millis)
    return -2;     // total variable over timeout
else
    return 1;
```

All that code can be replaced with a much easier to use and understand statement such as:

```
language:c
senseReading = myCapPad.capacitiveSensor(30);
```

The `myCapPad.capacitiveSensor()` takes care of all the heavy lifting and the`senseReading` variable contains the value sensed from our capacitive pad. Libraries make complex tasks easier so that we can focus on larger projects.

There are thousands of libraries out there! And luckily it's pretty easy to install them. This tutorial will show you how to install a library in Arduino v1.0.5 but should apply for many past, present, and future versions of Arduino.

Suggested Reading

Make sure you have a good understanding of the following concepts before getting any further into this tutorial.

What is an Arduino?

What is this 'Arduino' thing anyway? This tutorials dives into what an Arduino is and along with Arduino projects and widgets.

Installing Arduino IDE

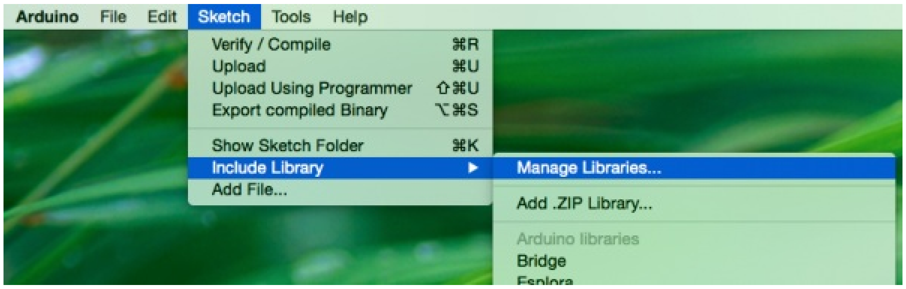
A step-by-step guide to installing and testing the Arduino software on Windows, Mac, and Linux.

The Arduino website also has great instructions on installing libraries if you need more information for using the Arduino IDE's library manager, importing a ***.zip** library, and manual installation.

Arduino's Official Library Instructions

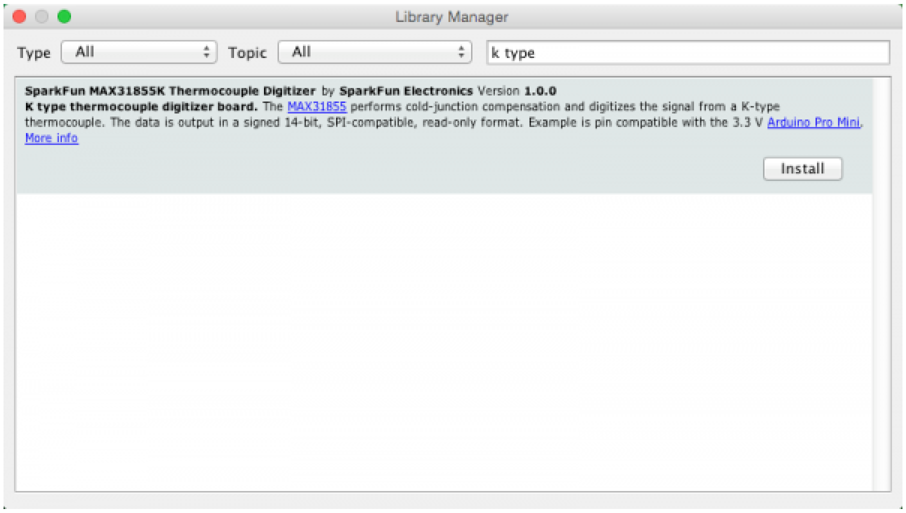
Using the Arduino Library Manager

The library manager was added starting with Arduino IDE versions 1.5 and greater (1.6.x). It is found in the 'Sketch' menu under 'Include Library', 'Manage Libraries...'



Arduino 1.5+ Library Manager Menu Option

When you open the Library Manager you will find a large list of libraries ready for one-click install. To find a library for your product, search for the product name or a keyword such as 'k type' or 'digitizer', and the library you want should show up. Click on the desired library, and the 'Install' button will appear. Click that button, and the library should install automatically. When installation finishes, close the Library Manager.



SparkFun MAX31855K Thermocouple Digitizer by **SparkFun Electronics** Version **1.0.0**
K type thermocouple digitizer board. The MAX31855 performs cold-junction compensation and digitizes the signal from a K-type thermocouple. The data is output in a signed 14-bit, SPI-compatible, read-only format. Example is pin compatible with the 3.3 V Arduino Pro Mini.
More info

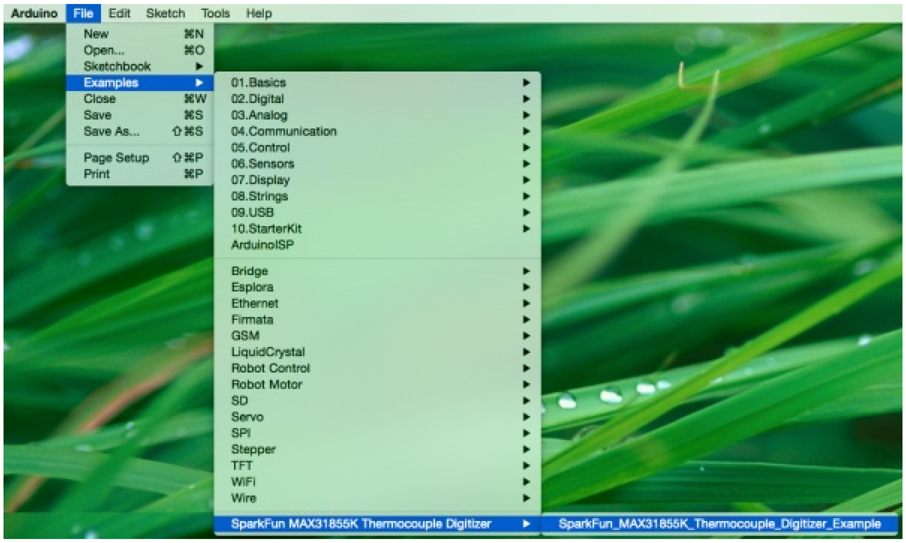
Library in the Library Manager, Ready to be Installed

Alternatively, if you have a library of your own you would like to add or a library that hasn't been added to the Library Manger yet, you can click the '**Add .ZIP Library**' option, which will then allow you to choose a folder or***.zip** file containing the library of your choice.

Heads up! In previous version of the Arduino IDE, all libraries were stored together deep within the contents folder of the Arduino application. However, in newer versions of the IDE, libraries added through the Library Manger can be found in a folder named '**libraries**' found in your Arduino Sketchbook folder.
For more information on the Library manger, including deleting and updating info, visit theGitHub: Arduino - Library Manager FAQ.

GitHub: Arduino - Library Manager FAQ

Now that the library is installed, an example sketch can be found in the 'Examples' submenu.



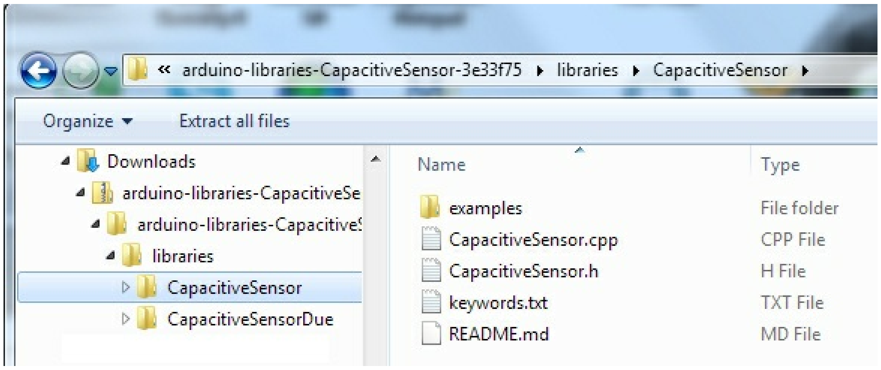
Example Sketch

Since this is a relatively new feature of the Arduino IDE at the time of this writing not all SparkFun products will have libraries in the library manager. We are adding new products and working our way through older products over time. If you don't find the library you need in the manager or for some reason cannot install one of the modern IDE releases, follow the instructions in the following sections.

Manually Installing a Library - Windows

This section covers manually installing a library under the Windows environment and utilizes quite a few screen shots. If you're more of a text learner then check out the Arduino tutorial on installing libraries.

We are going to use theCapacitive Sense library for this example. Navigate to the library's page and download the zip file.

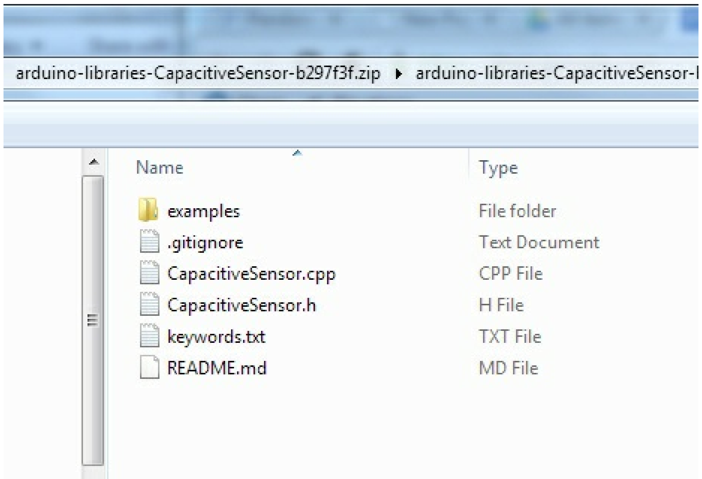

« arduino-libraries-CapacitiveSensor-3e33f75 ▸ libraries ▸ CapacitiveSensor ▸
Organize
Extract all files
Downloads
arduino-libraries-CapacitiveSe
arduino-libraries-Capacitive
libraries
CapacitiveSensor
CapacitiveSensorDue

Name	Type
examples	File folder
CapacitiveSensor.cpp	CPP File
CapacitiveSensor.h	H File
keywords.txt	TXT File
README.md	MD File

The contents of the Capacitive Sense zip file

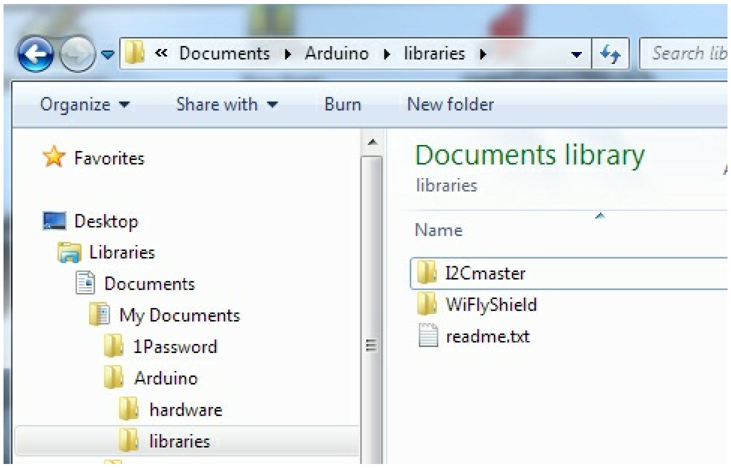
Find the zip file on your local computer (wherever downloaded files end up). Under Windows, you should be able to double click on the file to open it up.

This particular library contains libraries for both the basic Arduino and the more advanced Arduino Due. You can use both if you'd like, but, for this example, we will be copying and installing only the *CapacitiveSensor* folder.


arduino-libraries-CapacitiveSensor-b297f3f.zip ▸ arduino-libraries-CapacitiveSensor-

Name	Type
examples	File folder
.gitignore	Text Document
CapacitiveSensor.cpp	CPP File
CapacitiveSensor.h	H File
keywords.txt	TXT File
README.md	MD File

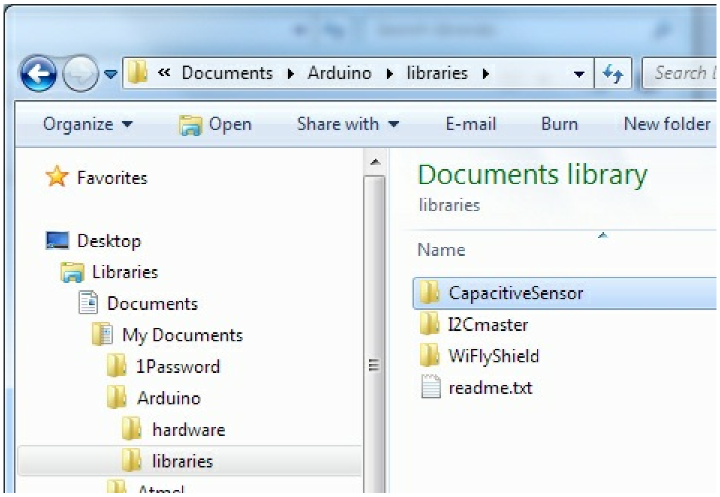
Libraries will usually contain a ***.cpp** file and **.h** file. Most will also contain an *examples* folder.



Name
I2Cmaster
WiFlyShield
readme.txt

Under Windows, Arduino stores all the add-on libraries within the *My Documents* folder. Here we see the location of the Arduino *libraries* folder.

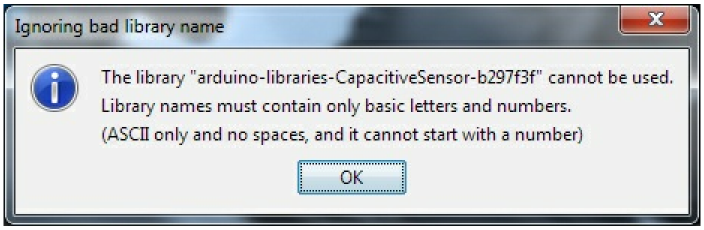
Open an explorer window and navigate to the libraries folder under *My Documents*. Now copy the new *CapacitiveSensor* folder to the *libraries* folder.



Name
CapacitiveSensor
I2Cmaster
WiFlyShield
readme.txt

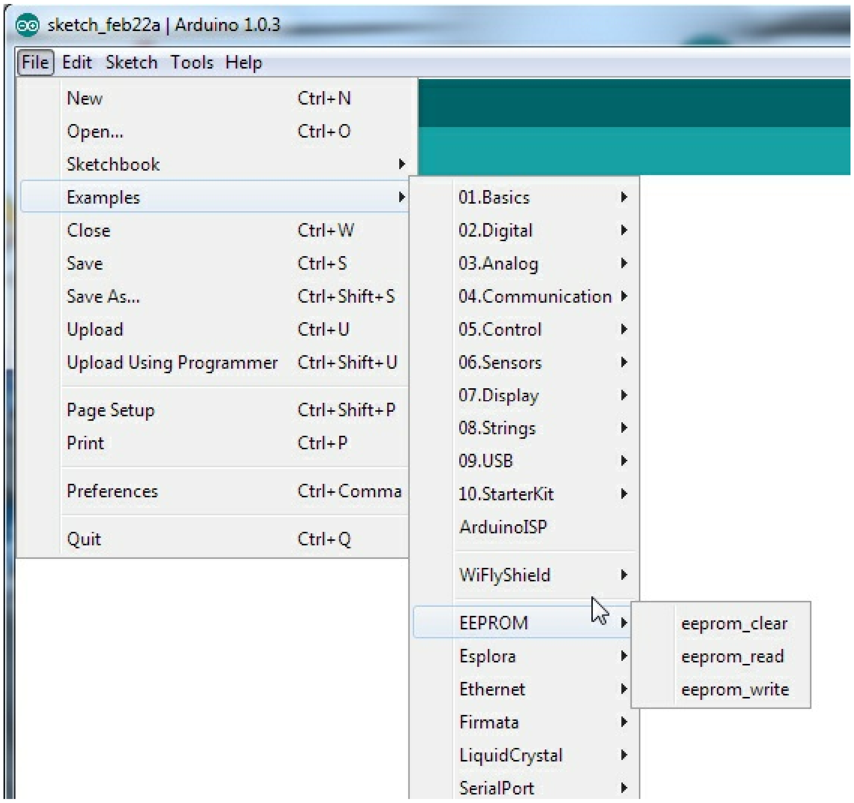
Success!

Note: Arduino does not allow library folders to contain symbols such as hyphens ‘ - ’. Arduino will throw an error upon starting up. If the library you are installing has a funky folder name then this step is the ideal time to clean it up.

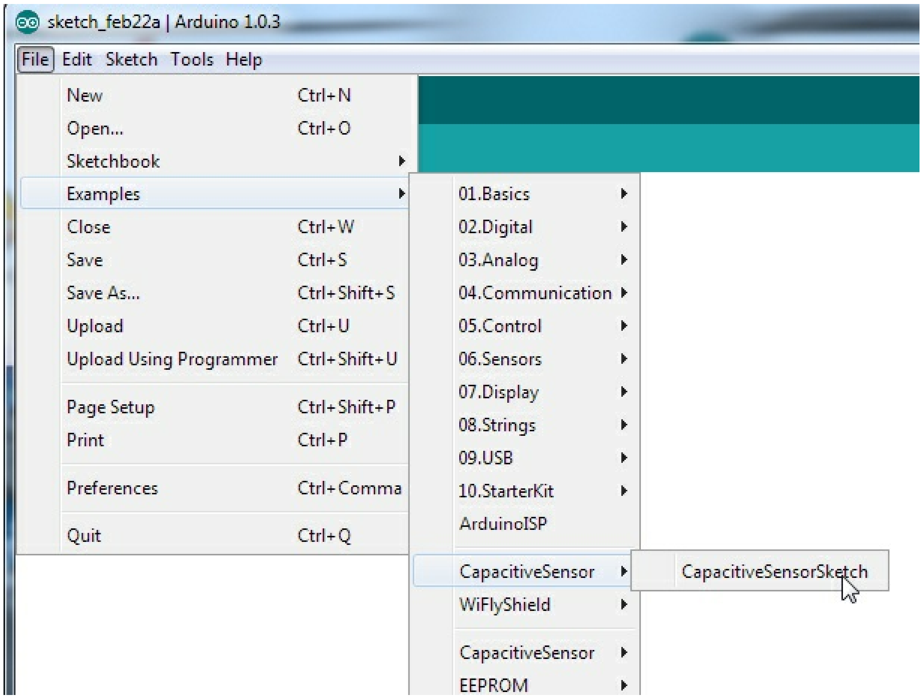


The library "arduino-libraries-CapacitiveSensor-b297f3f" cannot be used.
Library names must contain only basic letters and numbers.
(ASCII only and no spaces, and it cannot start with a number)

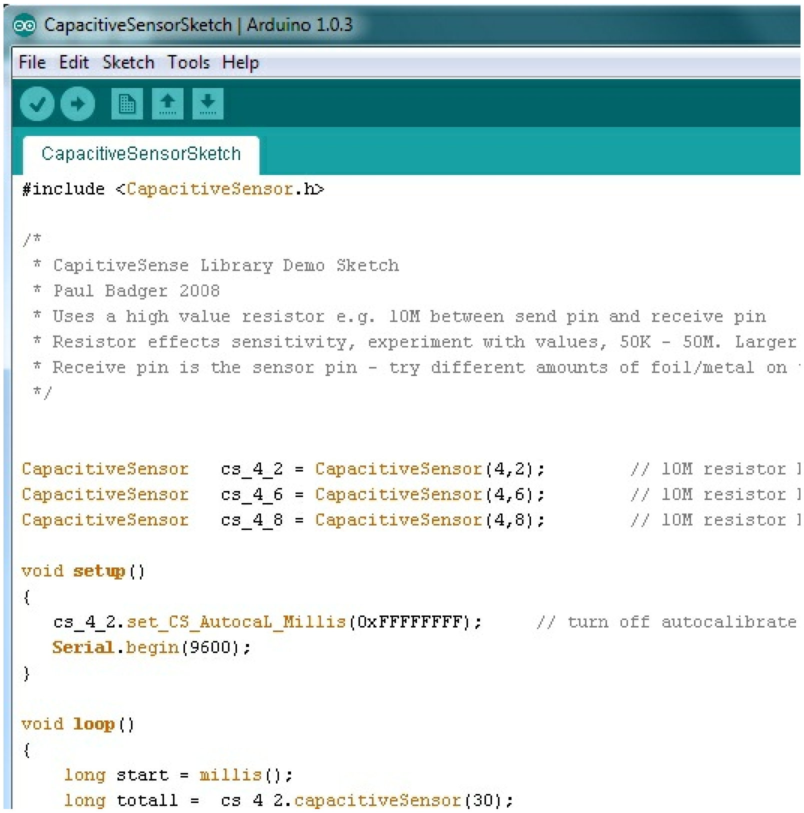
To verify the library has been installed correctly, open up the *Examples* folder under the Arduino IDE. Wait. Where's the *CapacitiveSensor* example? Did you have Arduino open when you copied and pasted the directory? Arduino checks the library directory at startup so if you already have Arduino open, you will need to restart Arduino any time you add to the libraries directory.



If you don't see the CapacitiveSensor example try closing and re-opening Arduino IDE.



There it is! Let’s open the example provided with our new library.


CapacitiveSensorSketch | Arduino 1.0.3
File Edit Sketch Tools Help
CapacitiveSensorSketch

```
#include <CapacitiveSensor.h>

/*
 * CapitiveSense Library Demo Sketch
 * Paul Badger 2008
 * Uses a high value resistor e.g. 10M between send pin and receive pin
 * Resistor effects sensitivity, experiment with values, 50K - 50M. Larger
 * Receive pin is the sensor pin - try different amounts of foil/metal on
 */


CapacitiveSensor   cs_4_2 = CapacitiveSensor(4,2);        // 10M resistor
CapacitiveSensor   cs_4_6 = CapacitiveSensor(4,6);        // 10M resistor
CapacitiveSensor   cs_4_8 = CapacitiveSensor(4,8);        // 10M resistor

void setup()
{
   cs_4_2.set_CS_AutocaL_Millis(0xFFFFFFFF);     // turn off autocalibrate
   Serial.begin(9600);
}

void loop()
{
    long start = millis();
    long total1 =  cs_4_2.capacitiveSensor(30);
```

Examples are the greatest thing about libraries! Good libraries will have well written examples showing how to use the library. These sketches are wonderful resources for example code and learning how to write good code under Arduino.

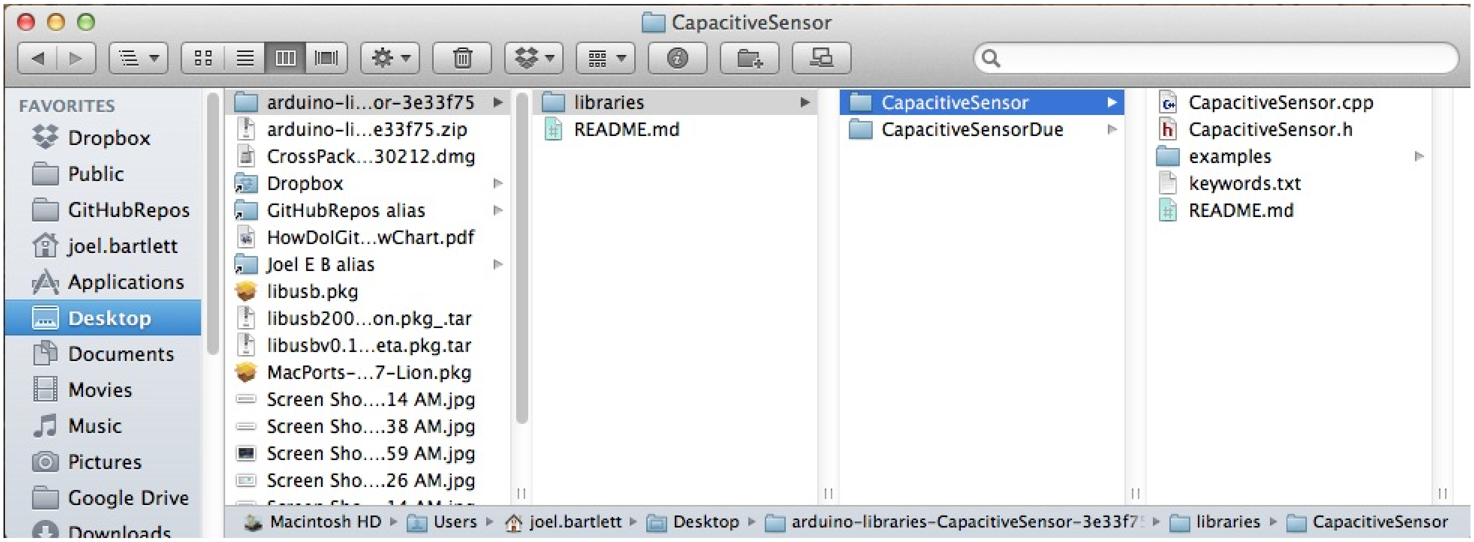
You now have the Capacitive Sensor library installed! Feel free to start from the example sketch, or begin writing your own code using the functions provided by the library. A library usually has documentation either on its site or written into readme files and example code. In general, to quickly learn how to use a library check out the example code.

Manually Installing a Library - Mac

This section covers manually installing a library under the Mac OS X environment. If you’re more of a text learner then check out the Arduino tutorial on installing libraries.

We are going to use theCapacitive Sense library for this example. Navigate to the library’s page and download the zip file.

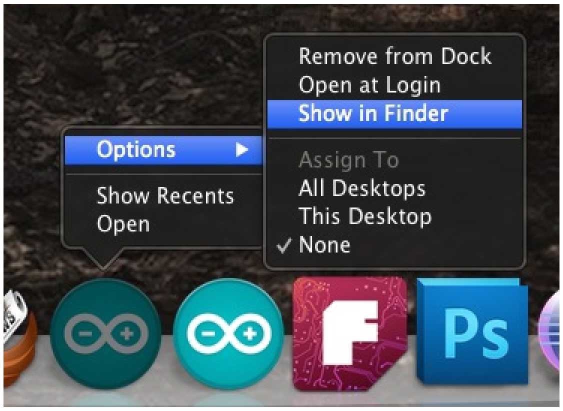
Find the zip file on your local computer (wherever downloaded files end up). Unzip it, and look at the folder contents.



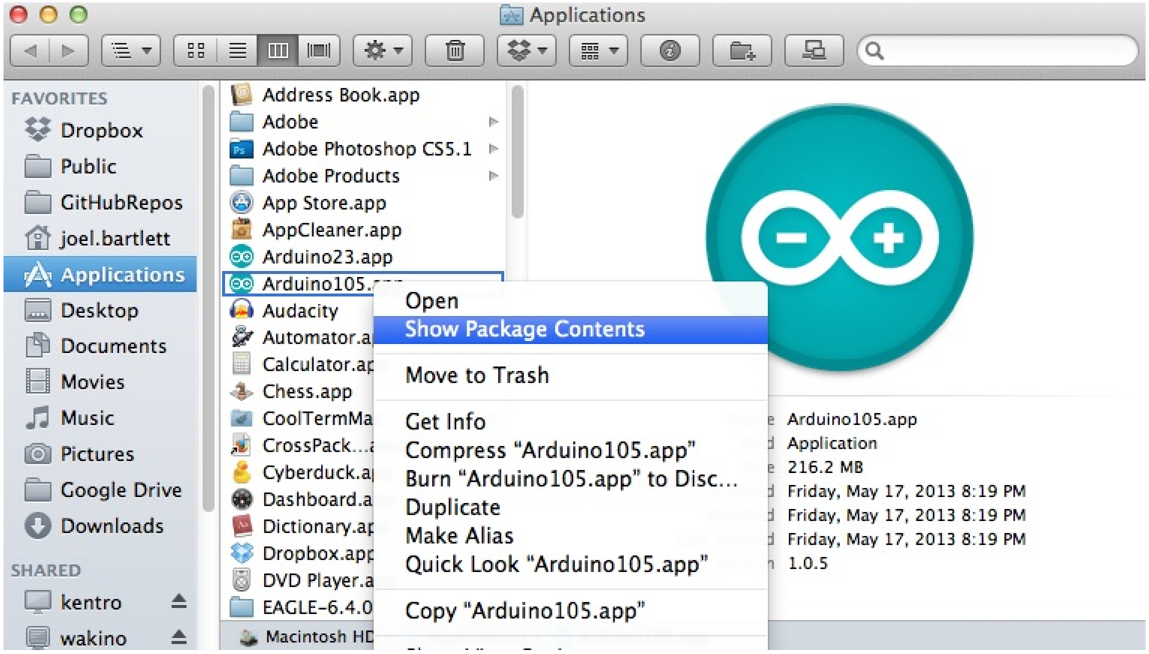
*The contents of the Capacitive Sense zip file. Libraries will usually contain a *.cpp* file and *.h* file. Most will also contain an *examples* folder.*

This particular library contains libraries for both the basic Arduino and the more advanced Arduino Due. You can use both if you'd like, but, for this example, we will be copying and installing only the *CapacitiveSensor* folder.

Now we need to add this folder to the Libraries folder for Arduino. This folder is somewhat hidden in OS X. To get there you can do one of two things. Option one, right-click on the Arduino icon located in your Dock. Go up to '**Options**', then click '**Show in Finder**'.

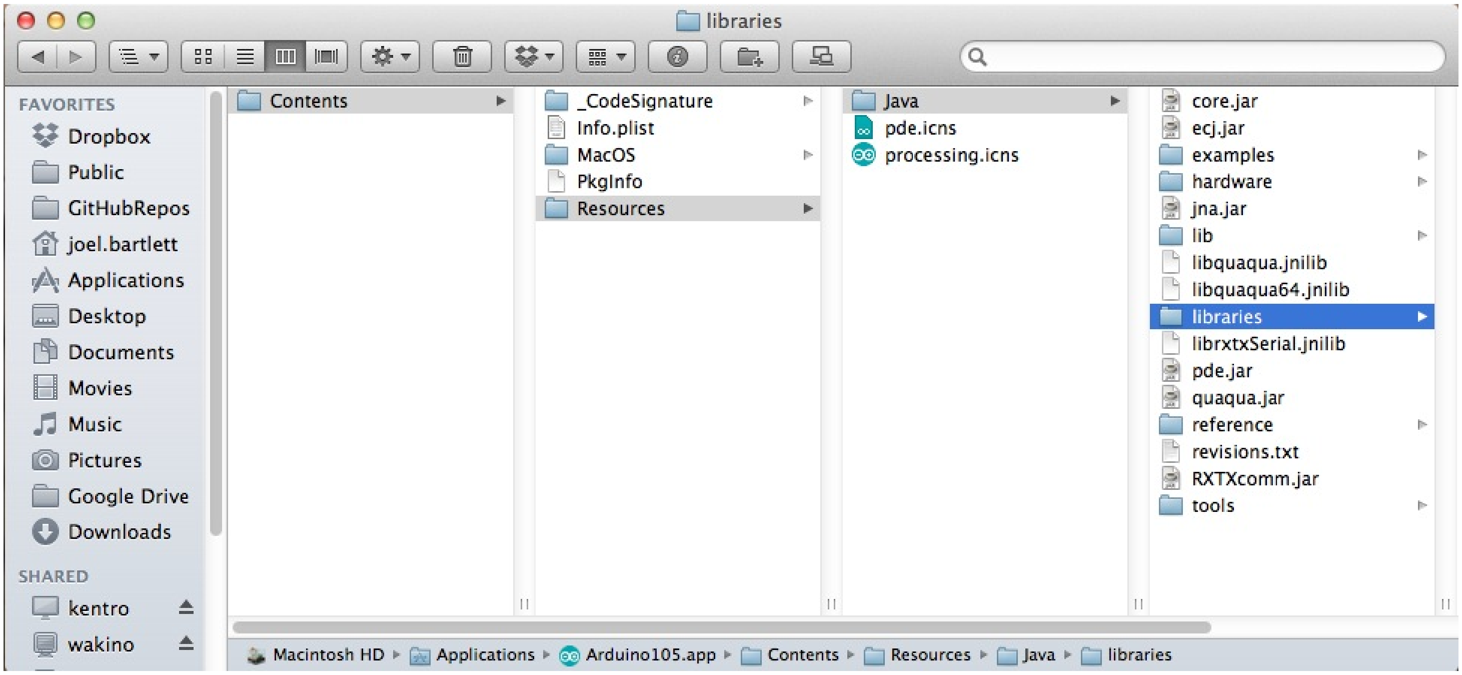


Option two, find the Arduino app located in your applications folder within Finder. Now, right-click on the Arduino app, and select '**Show Package Contents**'. Either option should get you to this point.

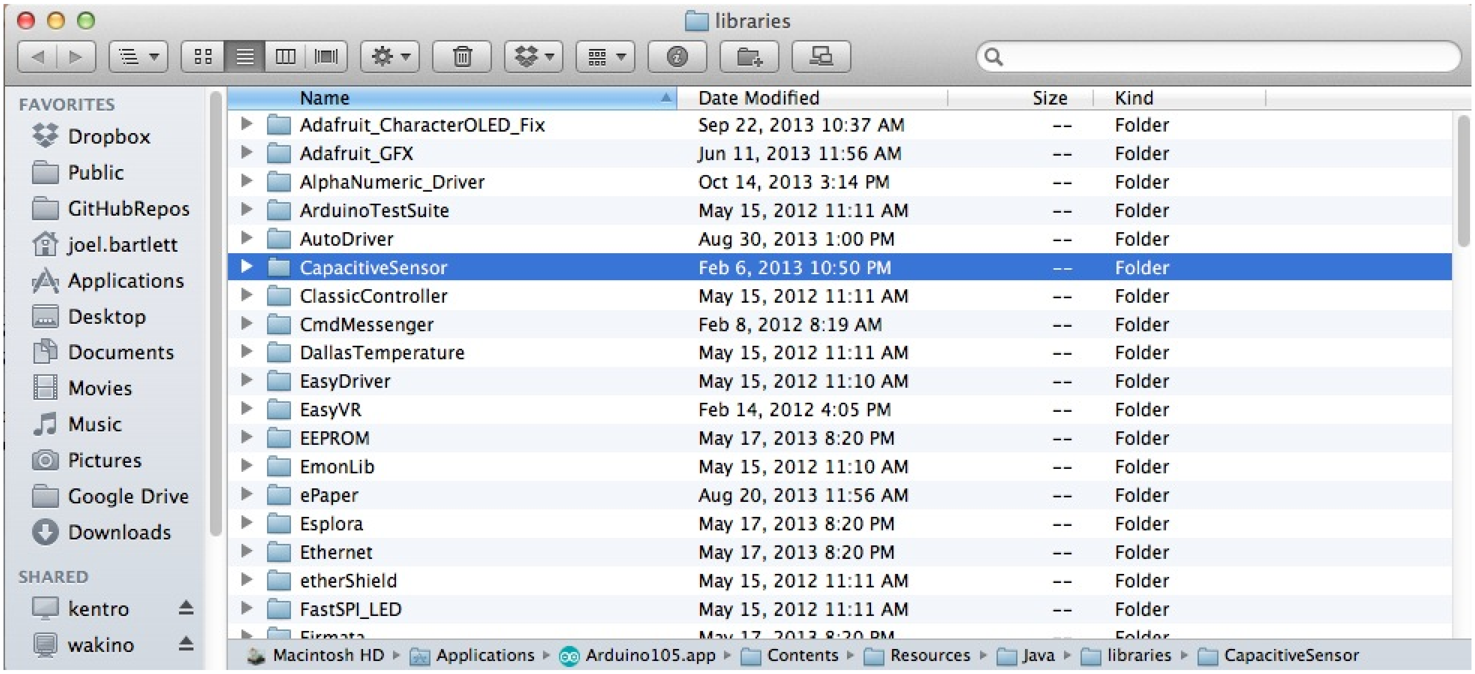


Navigate through the following folders, **Contents -> Resources -> Java**', until you reach the '**libraries**' folder.

Note: If you don't have a libraries folder, simply create one here in this location.



Inside the libraries folder is where you want to copy/move the library folder you just downloaded and unzipped. You'll also notice this is where all the default libraries live as well as any other libraries you may have installed in the past.



Name	Date Modified	Size	Kind
Adafruit_CharacterOLED_Fix	Sep 22, 2013 10:37 AM	--	Folder
Adafruit_GFX	Jun 11, 2013 11:56 AM	--	Folder
AlphaNumeric_Driver	Oct 14, 2013 3:14 PM	--	Folder
ArduinoTestSuite	May 15, 2012 11:11 AM	--	Folder
AutoDriver	Aug 30, 2013 1:00 PM	--	Folder
CapacitiveSensor	Feb 6, 2013 10:50 PM	--	Folder
ClassicController	May 15, 2012 11:11 AM	--	Folder
CmdMessenger	Feb 8, 2012 8:19 AM	--	Folder
DallasTemperature	May 15, 2012 11:11 AM	--	Folder
EasyDriver	May 15, 2012 11:10 AM	--	Folder
EasyVR	Feb 14, 2012 4:05 PM	--	Folder
EEPROM	May 17, 2013 8:20 PM	--	Folder
EmonLib	May 15, 2012 11:10 AM	--	Folder
ePaper	Aug 20, 2013 11:56 AM	--	Folder
Esplora	May 17, 2013 8:20 PM	--	Folder
Ethernet	May 17, 2013 8:20 PM	--	Folder
etherShield	May 15, 2012 11:11 AM	--	Folder
FastSPI_LED	May 15, 2012 11:11 AM	--	Folder
Firmata	May 17, 2013 8:20 PM	--	Folder

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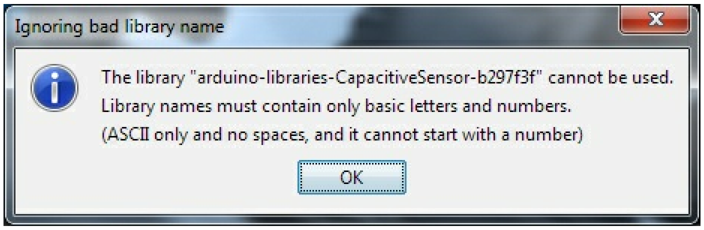

The library "arduino-libraries-CapacitiveSensor-b297f3f" cannot be used.
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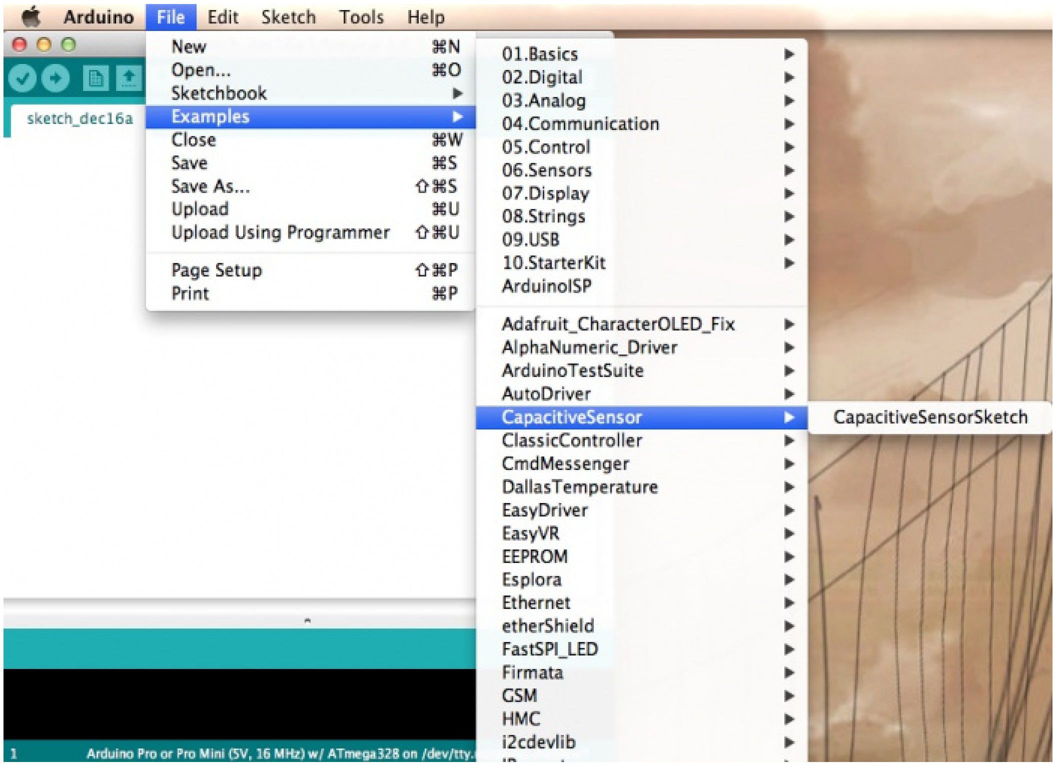
Next, make sure that restart the Arduino IDE if it was open when you installed the library. This is a very important, often overlooked step. If you don't restart, the library you just installed will not yet be available to the IDE.

To verify the library has been installed correctly, open up the **File** > **Examples**' folder under the Arduino IDE.



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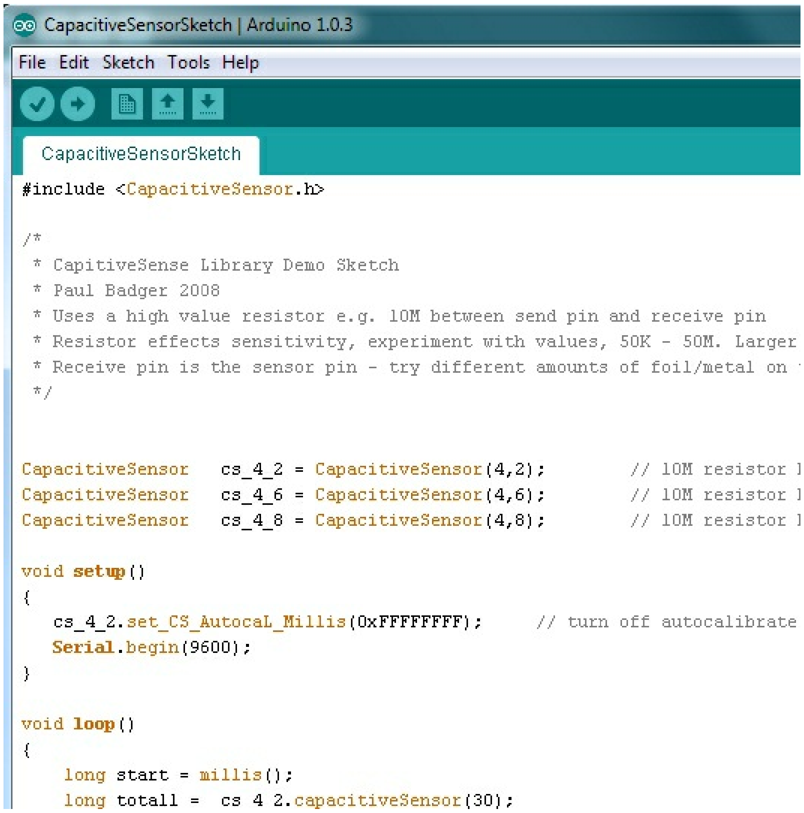
CapacitiveSensorSketch | Arduino 1.0.3
File Edit Sketch Tools Help
CapacitiveSensorSketch

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 * Paul Badger 2008
 * Uses a high value resistor e.g. 10M between send pin and receive pin
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Resources and Going Further

If you're looking for some great libraries to get started with, here are some of our favorites:

- TinyGPS is the gold standard for interfacing to GPS modules.
- SevSeg is a library we wrote to make controlling 7-segment displays easier.
- Sdfat is a very good library that allows you to read and write files to SD cards. Great for datalogging! Be sure to checkout all the examples included with the library.
- MP3Shield is a great example of a customer of SparkFun taking complex example code and creating a very good library to make the device easier to use.
- EEPROM is a built-in library that allows users to read and store settings within the non-volatile memory of the ATmega328. Very useful!
- Capacitive Sensor is the library we covered in this tutorial. It’s great for non-contact capacitive switches and field sensing.
- Infrared Remote is a great library for reading signals from IR remotes and controlling IR remote based things like TVs and sound systems.

Built-In Libraries

You may not realize it, but you're probably already using libraries! If you've used:

```
Serial.print("Hello world!");
```

Then you're using the Serial() library built in to Arduino. Arduino has quite a few built-in libraries. Here’s the list of the standard libraries that you can start using immediately!

Arduino.cc Standard Libraries

Write your Own Arduino Library

Once you’ve used a handle of different libraries, consider writing your own! Here’s a good tutorial showing how to write your own library so that you can help the world by making complex tasks a little easier.

Arduino.cc Writing a Library for Arduino Library

Including Your Library in the Library Manager

If you would like to have it included in the Arduino IDE Library Manager, make sure that your library fits the standards.

GitHub: Arduino - Wiki Arduino IDE 1.5: Library Specification

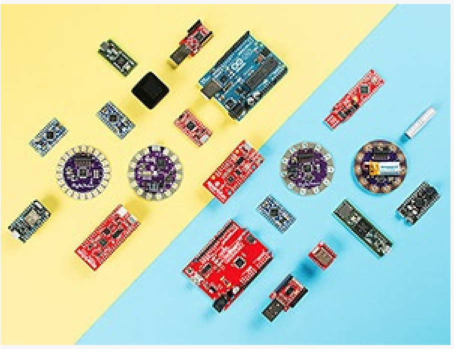
Then submit an issue request for you 3rd party library in the GitHub repo for the Arduino IDE linked below. For an example of submitting a request, check out SparkFun's fingerprint scanner TTL library request.

GitHub: Arduino - Issues

Looking for the right Arduino?

Check out our **Arduino Comparison Guide**! We've compiled every Arduino development board we carry, so you can quickly compare them to find the perfect one for your needs.

Take me there!



More Arduino

If you're looking for more Arduino tutorials, have a look at these:

Installing an Arduino Bootloader

This tutorial will teach you what a bootloader is and why you would need to install or reinstall it. We will also go over the process of burning a bootloader by flashing a hex file to an Arduino microcontroller.

Connecting Arduino to Processing

Send serial data from Arduino to Processing and back - even at the same time!

Data Types in Arduino

Learn about the common data types and what they signify in the Arduino programming environment.

Choosing an Arduino for Your Project

Examining the diverse world of Arduino boards and understanding the differences between them before choosing one for a project.

Or check out this blog post for more ideas.

Genericizing Arduino Libraries

October 3, 2016

Read Post

How to Write A Great Arduino Library

February 19, 2020

Read Post