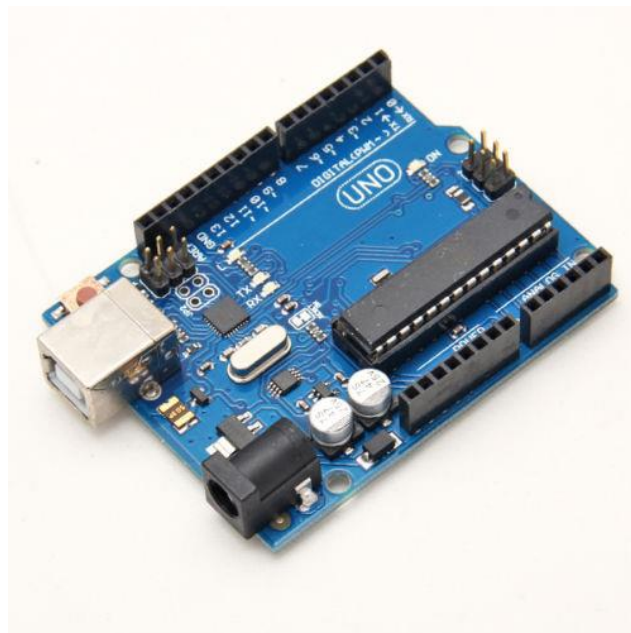


Chapter 1: Internet-Controlled PowerSwitch

Getting started

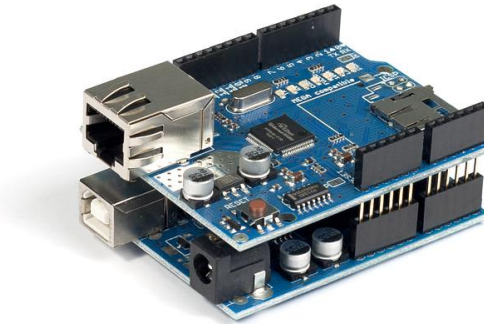
Arduino Ethernet Shield



Arduino UNO R3 (Front View)



Arduino Ethernet Shield R3 (Front View)



Arduino Ethernet Shield R3 (top) is stacked with Arduino UNO R3 (bottom) (Front View)



WIZnet W5100 Ethernet controller (Top View)

The Arduino Ethernet board

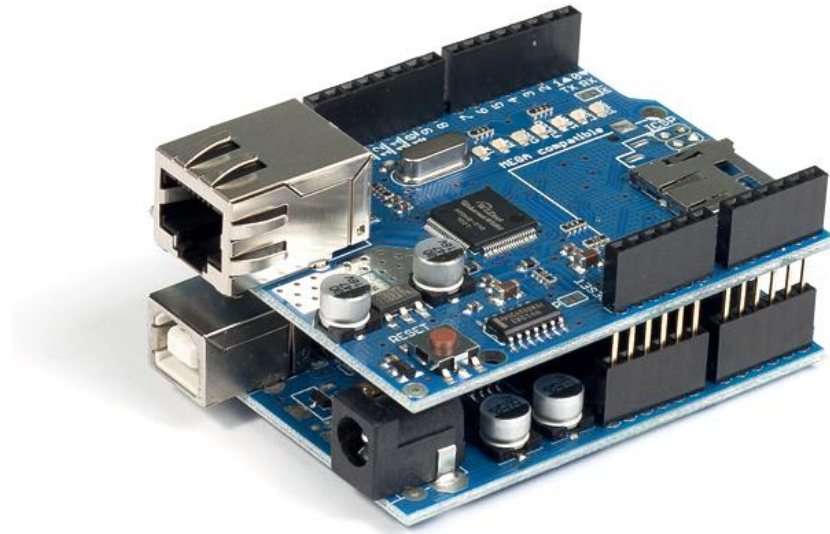


Arduino Ethernet Board (Front View)

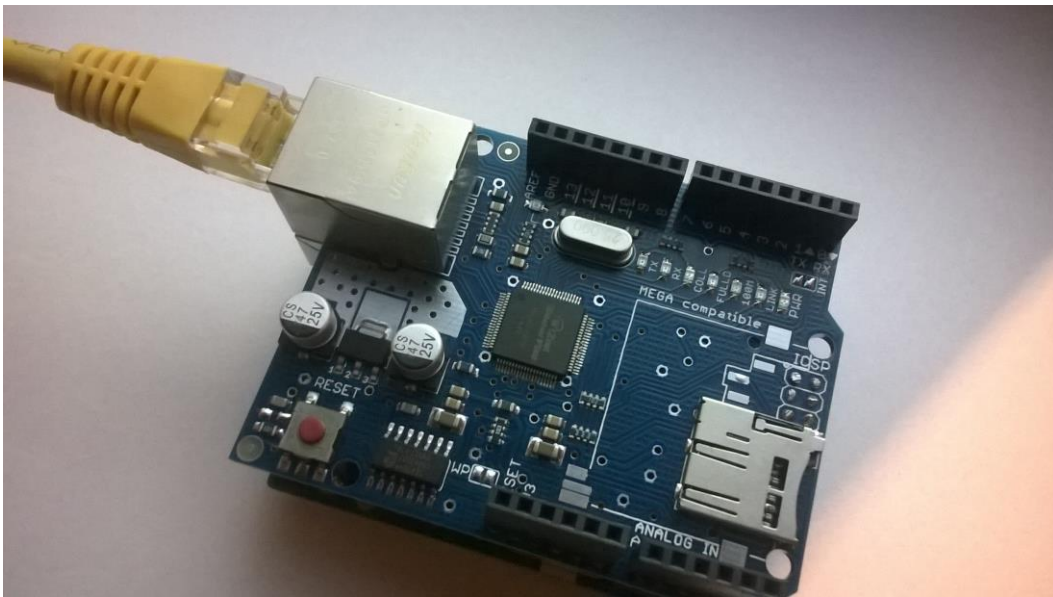


FTDI cable 5V (Source: https://commons.wikimedia.org/wiki/File:FTDI_Cable.jpg)

Connecting Arduino Ethernet Shield to the Internet



Fritzing representation of Arduino and Ethernet shield stack

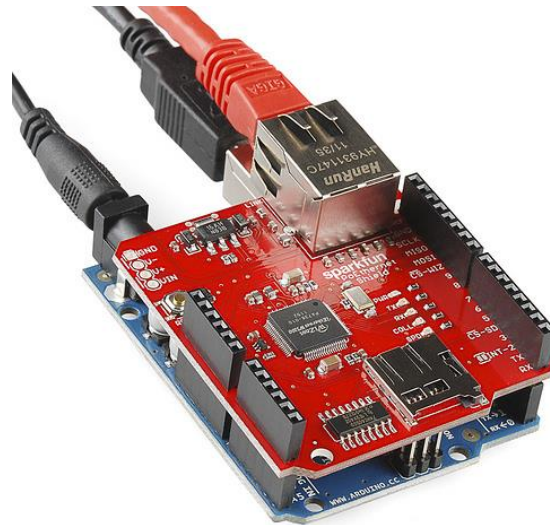


One end of the Ethernet cable is connected to the Arduino Ethernet board



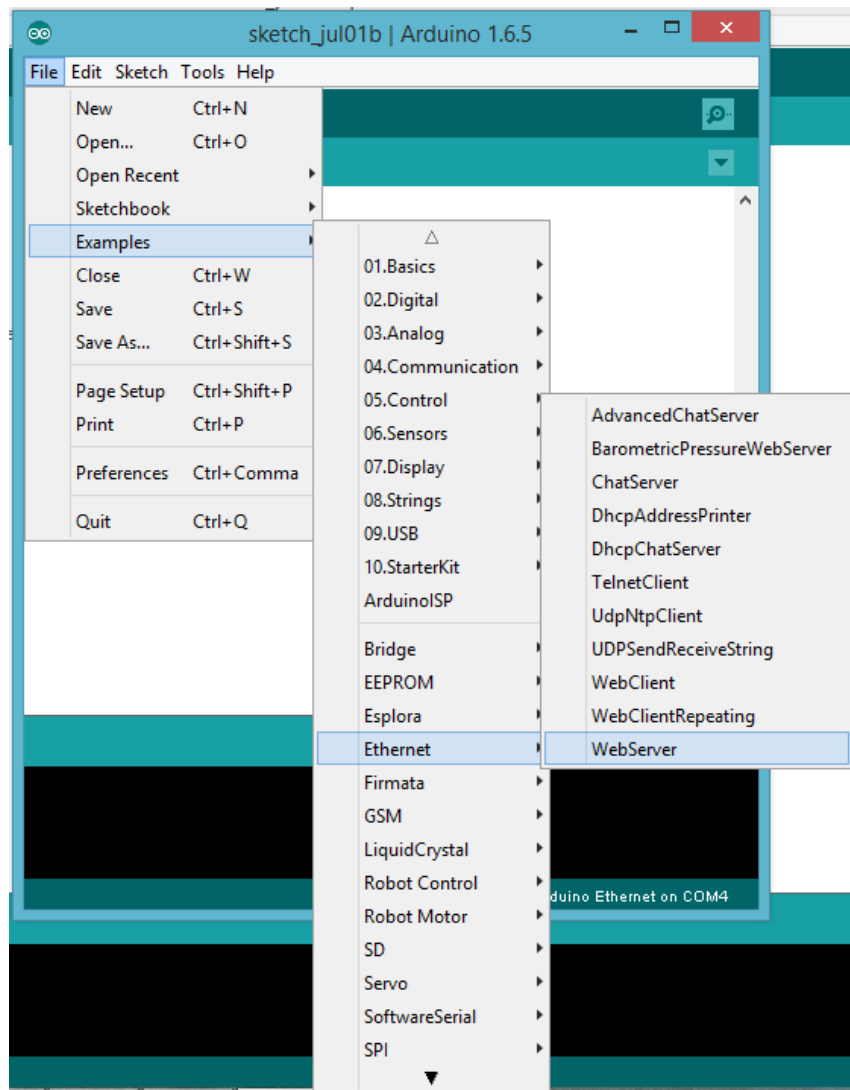
Other end of the Ethernet cable is connected to router/switch

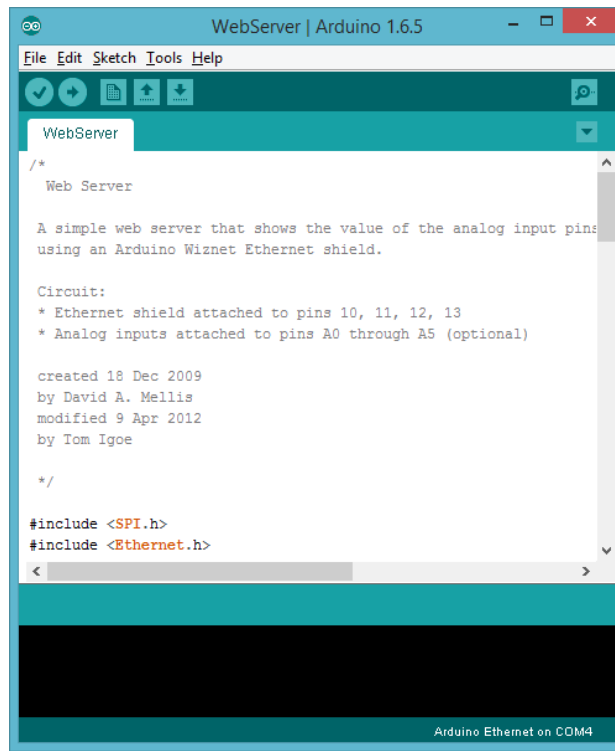
1.



One end of the Ethernet cable is connected to the Ethernet shield (top) and the power connector and USB cable is connected to the Arduino board (bottom)

Testing your Arduino Ethernet Shield





The screenshot shows the Arduino IDE interface with the 'WebServer' sketch loaded. The code is as follows:

```
/*
  Web Server

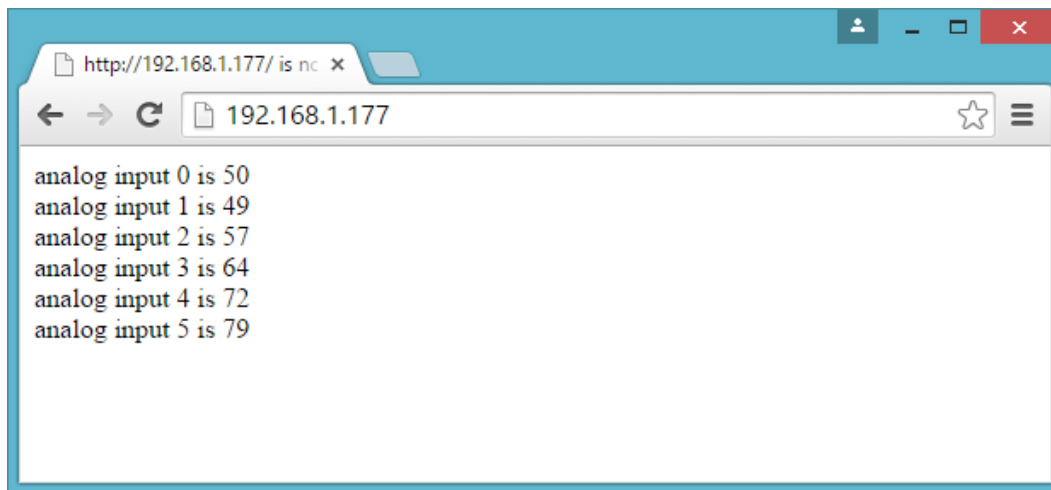
  A simple web server that shows the value of the analog input pins
  using an Arduino Wiznet Ethernet shield.

  Circuit:
  * Ethernet shield attached to pins 10, 11, 12, 13
  * Analog inputs attached to pins A0 through A5 (optional)

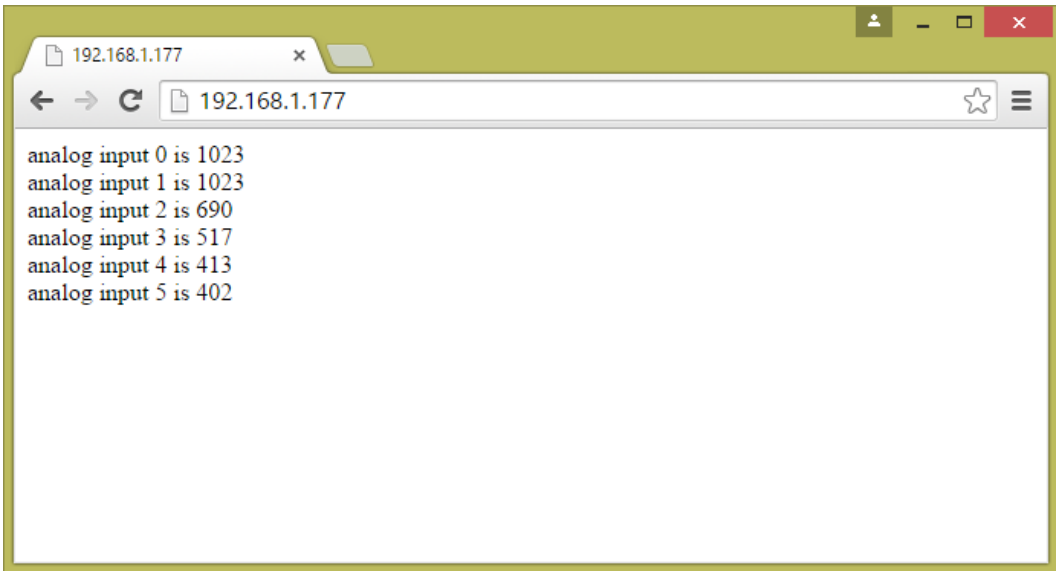
  created 18 Dec 2009
  by David A. Mellis
  modified 9 Apr 2012
  by Tom Igoe

  */

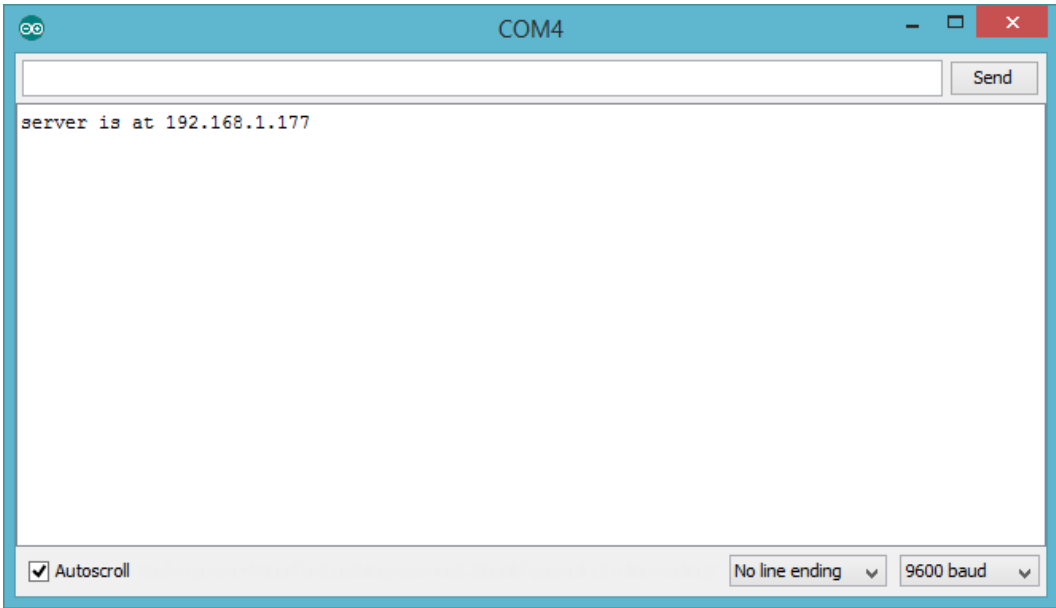
#include <SPI.h>
#include <Ethernet.h>
```



Output for Arduino Ethernet Board: Analog input values are displaying on Google Chrome browser, refreshes every 5 seconds



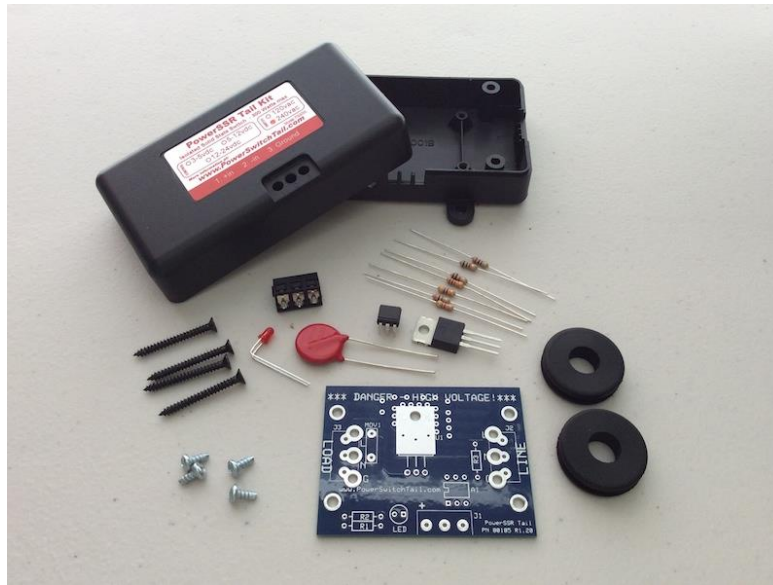
Output for Arduino UNO + Arduino Ethernet Shield: Analog input values are displaying on Google Chrome browser, refreshes every 5 seconds



Arduino Serial Monitor Prints the static IP address of Arduino Ethernet Shield

Selecting a PowerSwitch Tail

PN PSSRKT-240



PN PSSRKT-240 Normally Open (NO) version—240V AC



PN PSSRKT-240 Normally Open (NO) version—240V



PN PSSRKT-240 Normally Open (NO) version—240V

PN80135

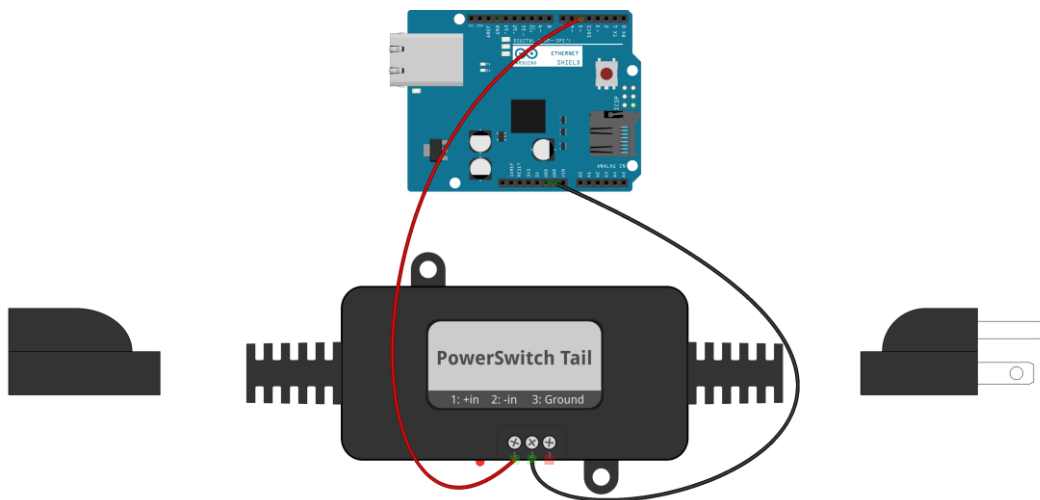


PN80135 Normally Open (NO) version—120V AC (left-hand side plug for LOAD and right-hand side plug for LINE)

Wiring PowerSwitch Tail with Arduino Ethernet Shield

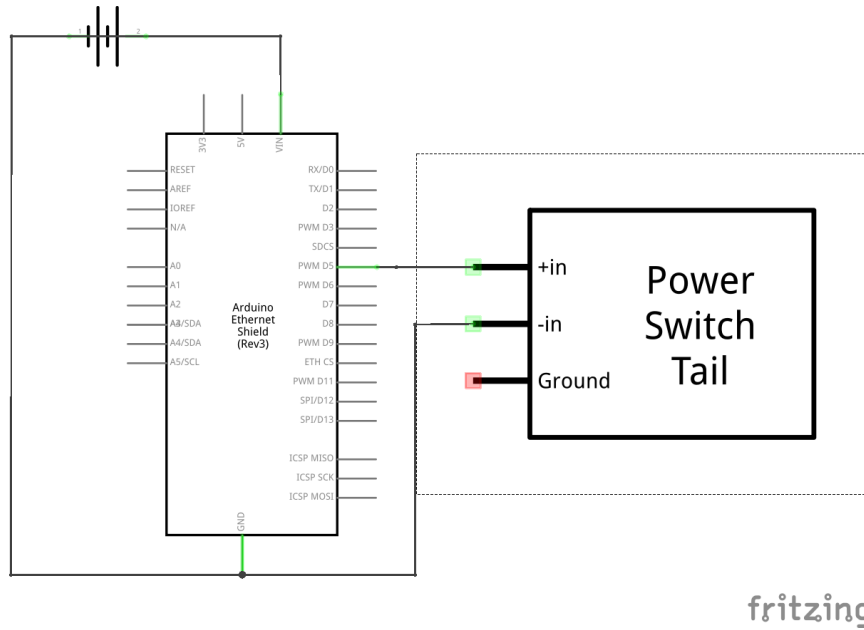


Two wires from Arduino is connected to the PowerSwitch Tail



fritzing

PowerSwitch Tail is connected with Ethernet Shield—Fritzing representation



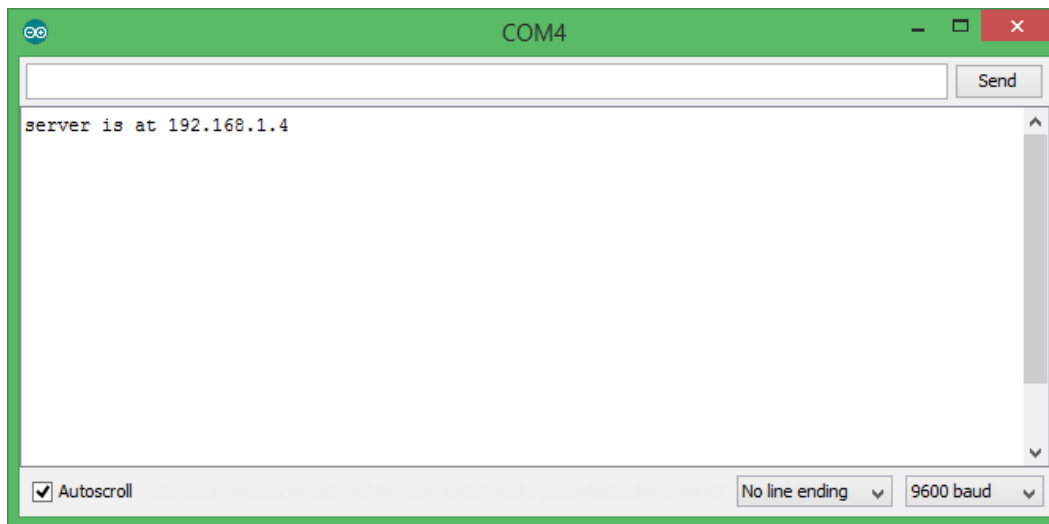
fritzing

PowerSwitch Tail is connected with Ethernet Shield—Schematic

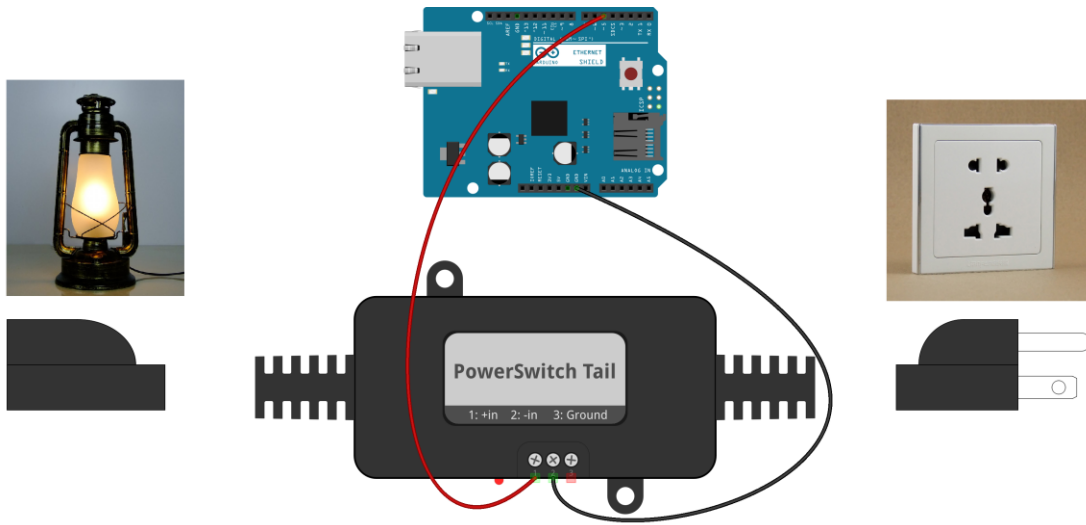
Turning PowerSwitch Tail into a simple web server

A step-by-step process of building a web-based control panel

Handling client requests by HTTP GET



IP address assigned by the DHCP



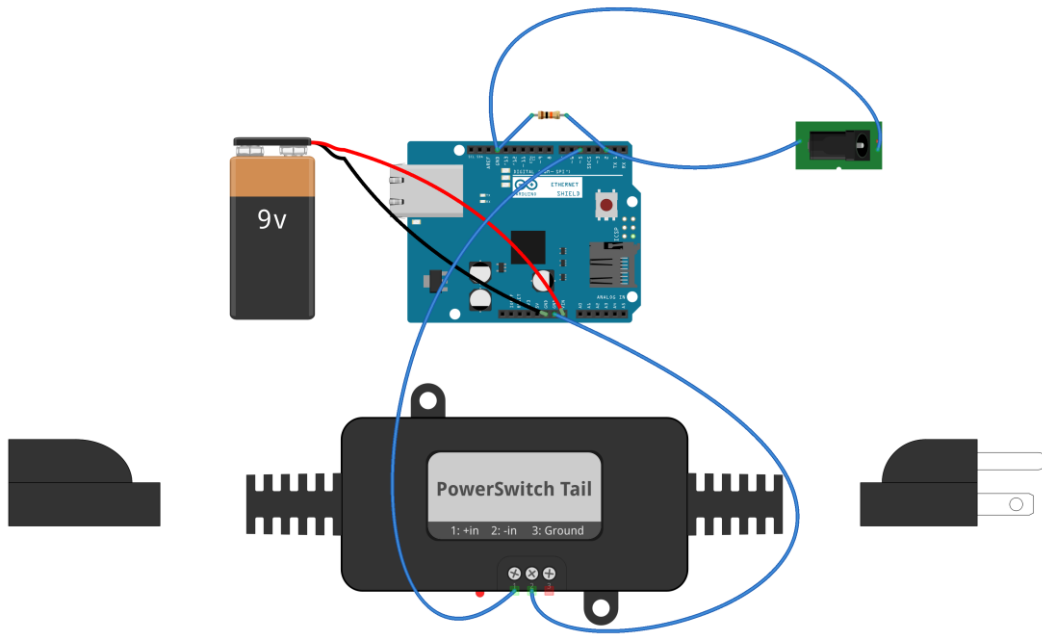
fritzing

Electrical lamp is controlled by PowerSwitch Tail



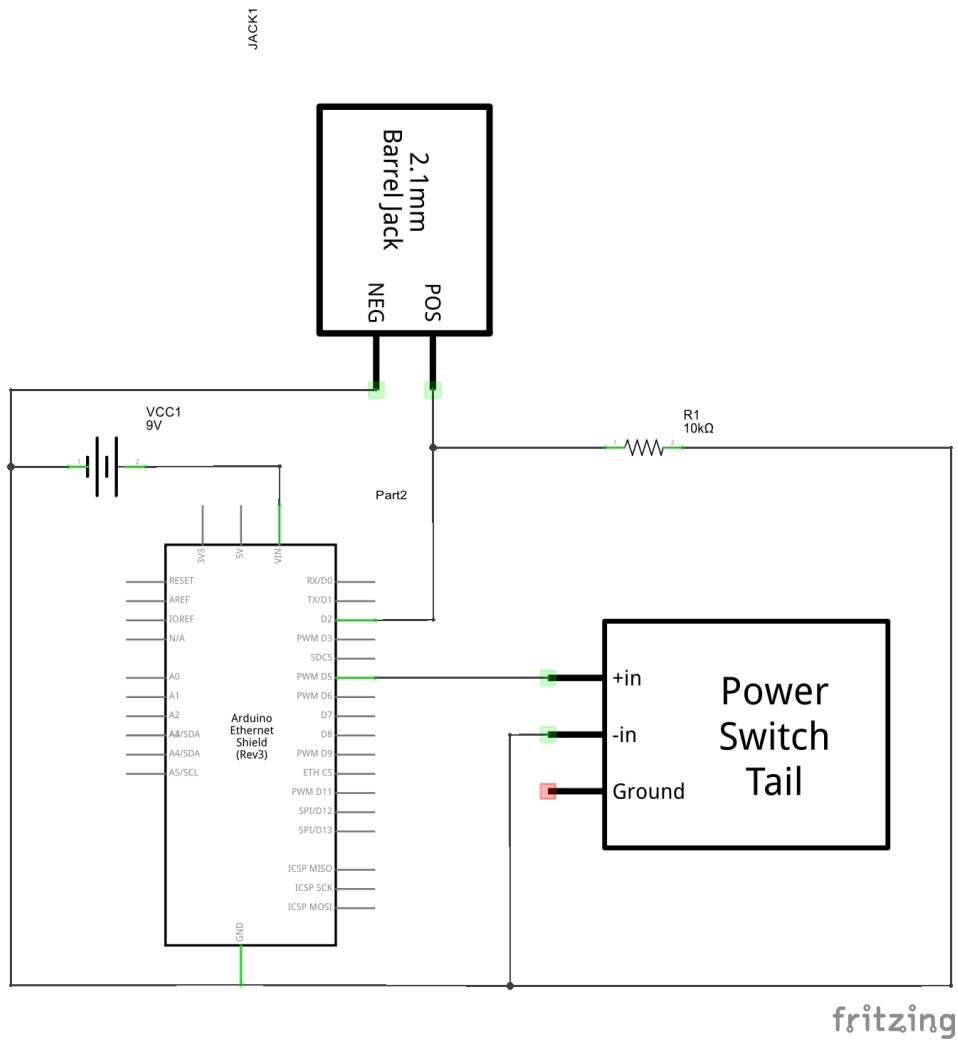
PowerSwitch Tail control panel accessed by Google Chrome browser

Sensing the availability of mains electricity



fritzing

Wiring diagram



Schematic

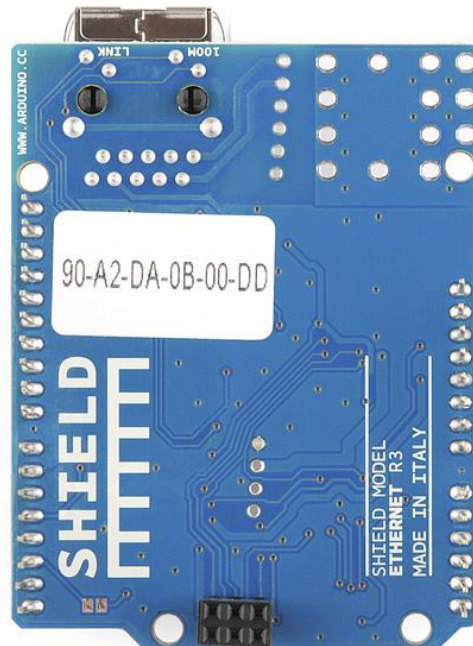
Adding Cascade Style Sheet to the web user interface



MetroUI CSS style applied to radio buttons

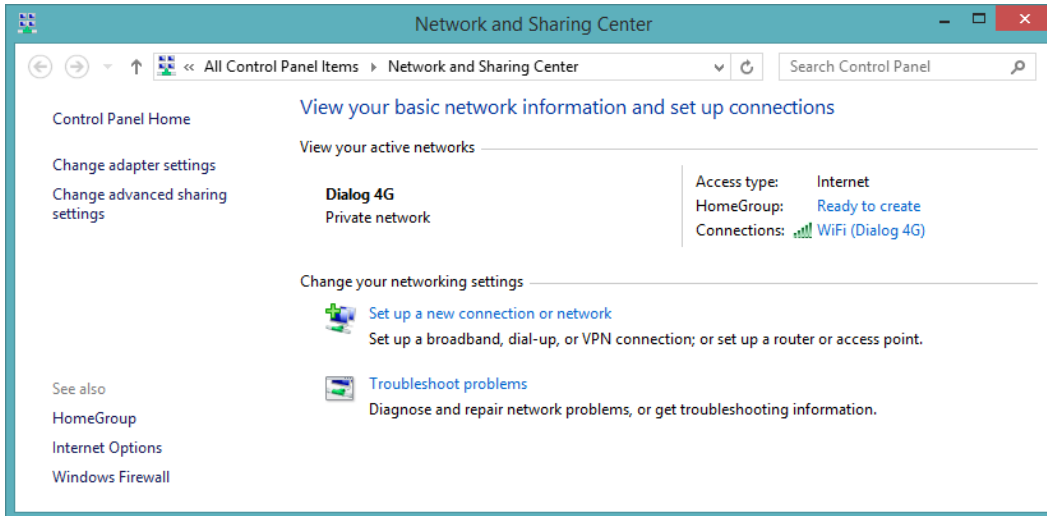
Finding the MAC Address and obtaining a valid IP address

Finding the MAC address



Obtaining an IP Address


Assigning a static IP address



WiFi Status



General

Connection

IPv4 Connectivity:	Internet
IPv6 Connectivity:	No Internet access
Media State:	Enabled
SSID:	Dialog 4G
Duration:	21:27:28
Speed:	72.0 Mbps
Signal Quality:	

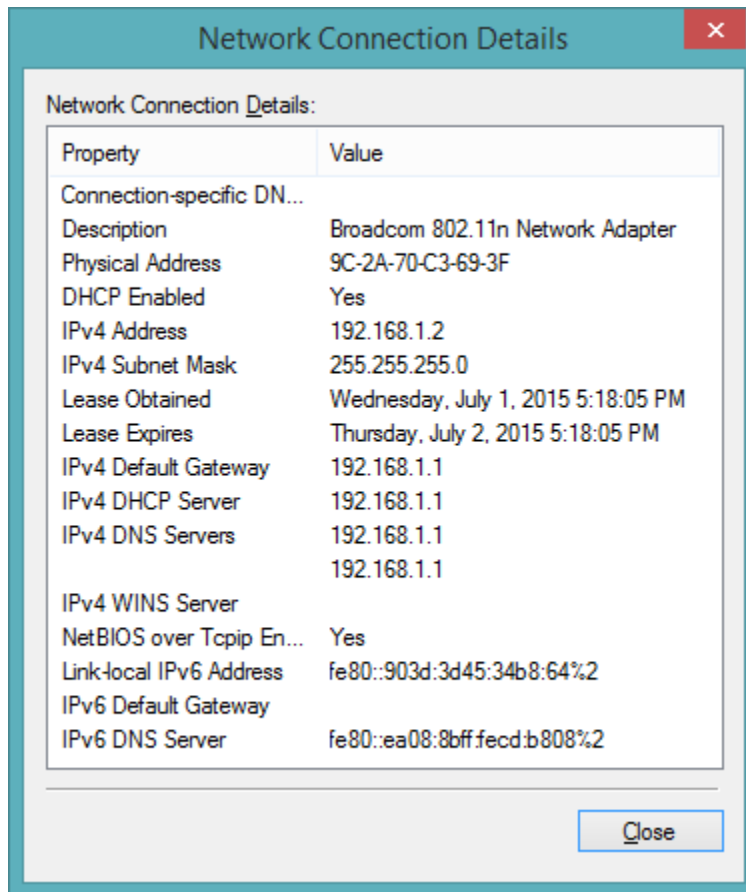
[Details...](#) [Wireless Properties](#)

Activity

	Sent		Received
Bytes:	4,540,697		17,050,350

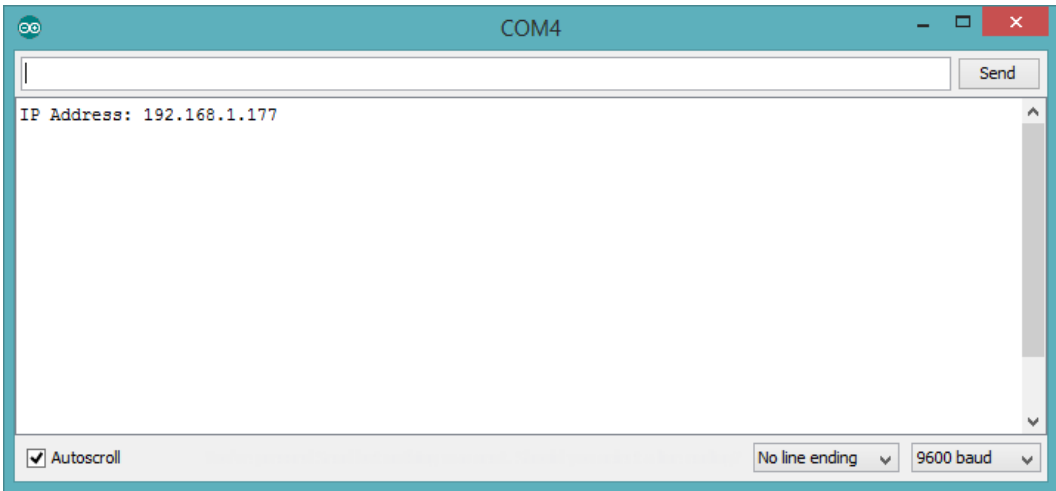
[Properties](#) [Disable](#) [Diagnose](#)

[Close](#)



Device List

Index	Computer Name	MAC Address	IP Address	Lease Time	Status	Type	Operation
1	DELL	9C:2A:70:C3:69:3F	192.168.1.2	0 days 22 hours 58 minutes 38 seconds	Active	Wi-Fi	Kick Out
2	Windows-Phone	A8:44:81:43:AD:C4	192.168.1.3	0 days 22 hours 59 minutes 51 seconds	Active	Wi-Fi	Kick Out



Static IP address

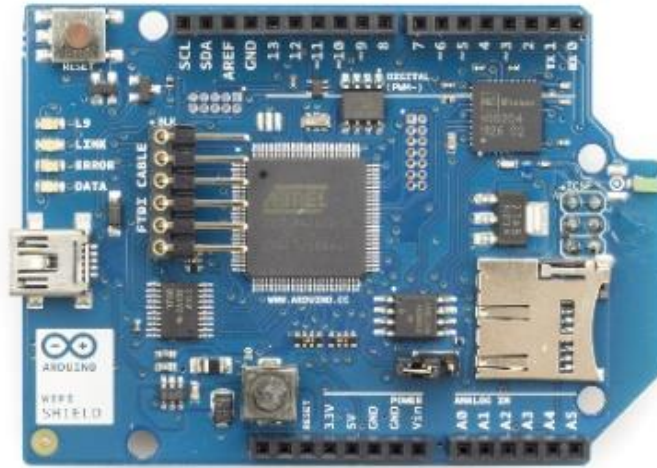
Obtaining an IP address using DHCP



DHCP assigned IP address

Chapter 2: Wi-Fi Signal Strength Reader and Haptic Feedback

Arduino WiFi Shield



Arduino WiFi Shield (Top View)



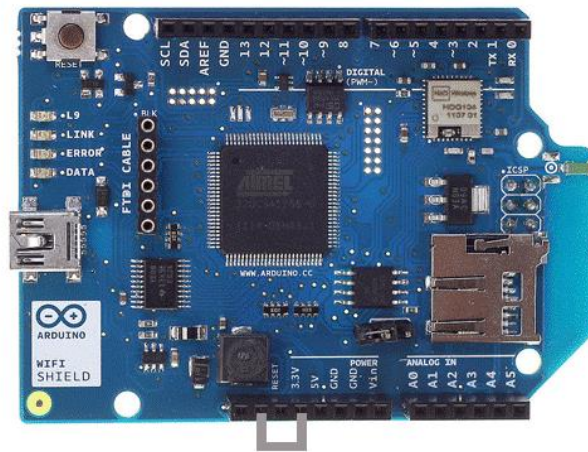
Arduino WiFi Shield (Bottom View)

Stacking WiFi Shield with Arduino



Arduino WiFi shield is stacked with Arduino UNO

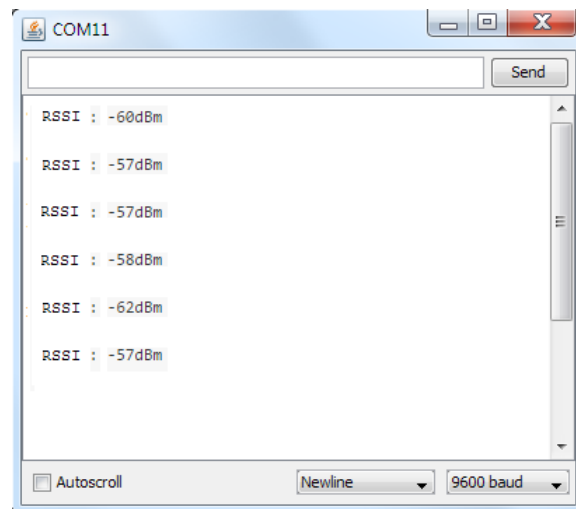
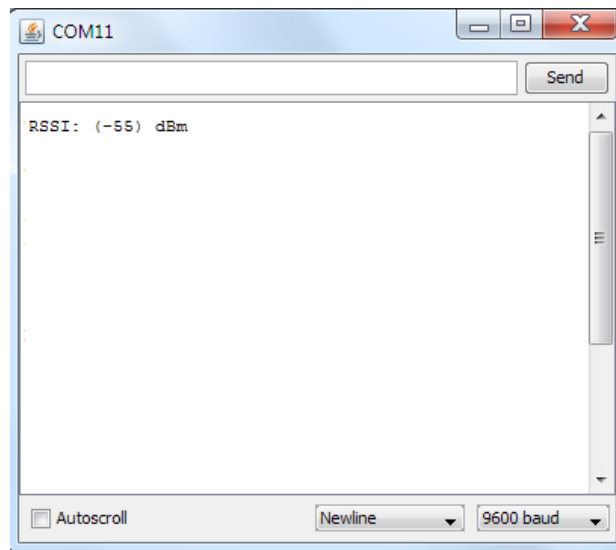
Hacking an Arduino earlier than REV3



Jumper wire attached from 3.3V TO IOREF

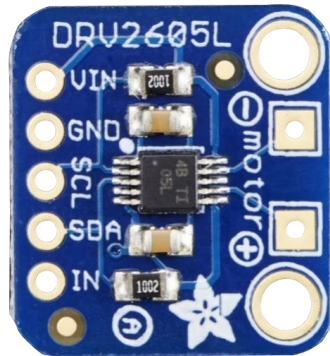
WiFi signal strength and RSSI

Reading the Wi-Fi signal strength



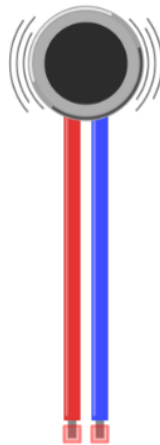
Haptic feedback and haptic motors

Getting started with the Adafruit DRV2605 haptic controller



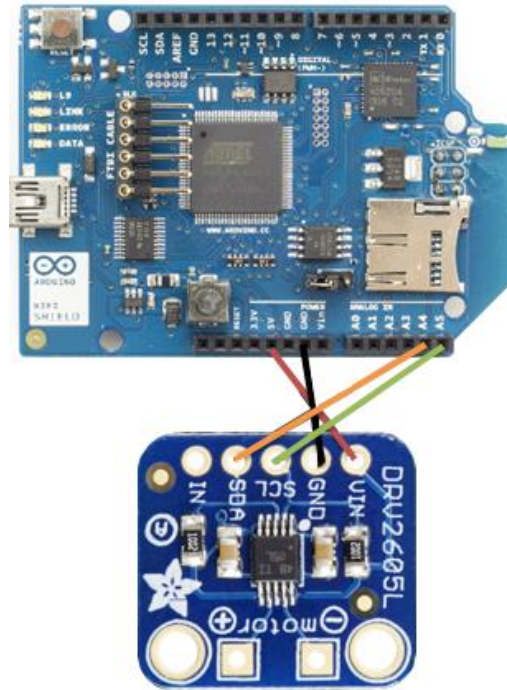
DRV2605 breakout board (Top View)

Selecting a correct vibrator

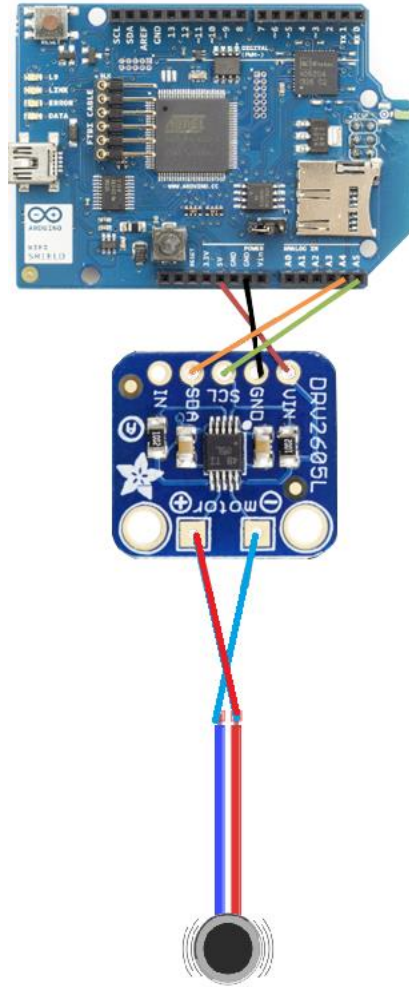


Fritzing representation of a vibrator

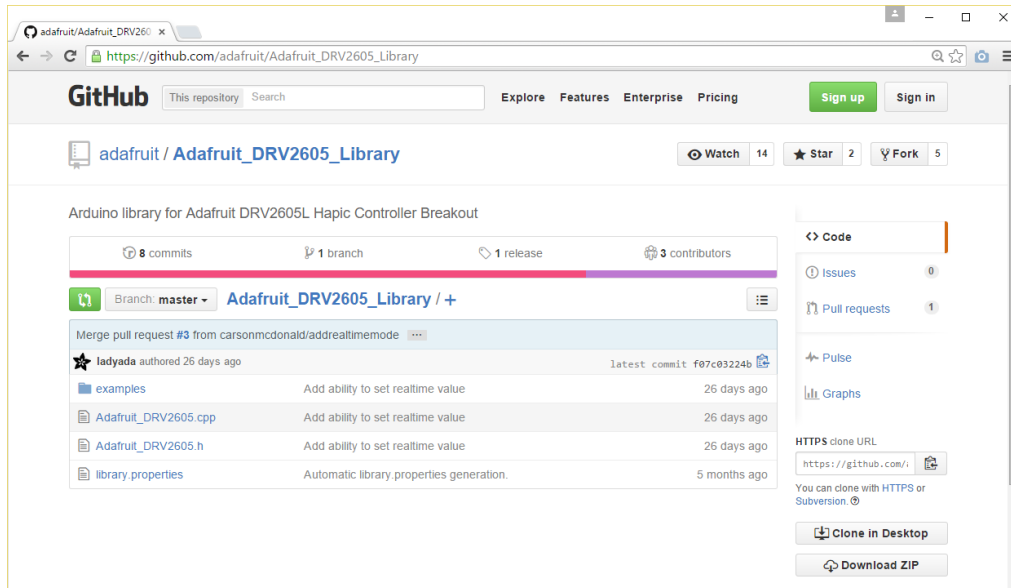
Connecting a haptic controller to Arduino WiFi Shield



Soldering a vibrator to the haptic controller breakout board



Downloading the Adafruit DRV2605 library



Adafruit DRV2605 library at GitHub

Chapter 3: Internet Connected Smart Water Meter

Water flow sensors

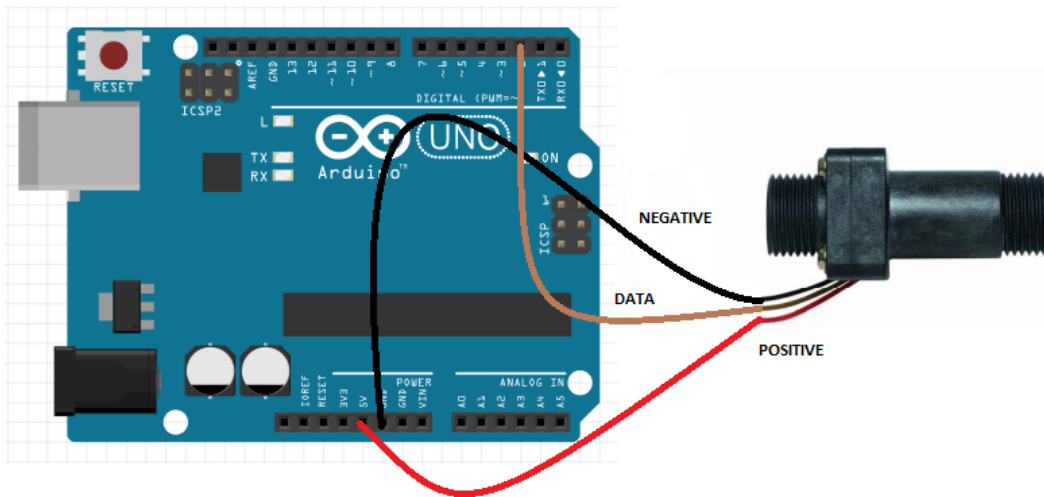


Liquid flow sensor – the flow direction is marked with an arrow

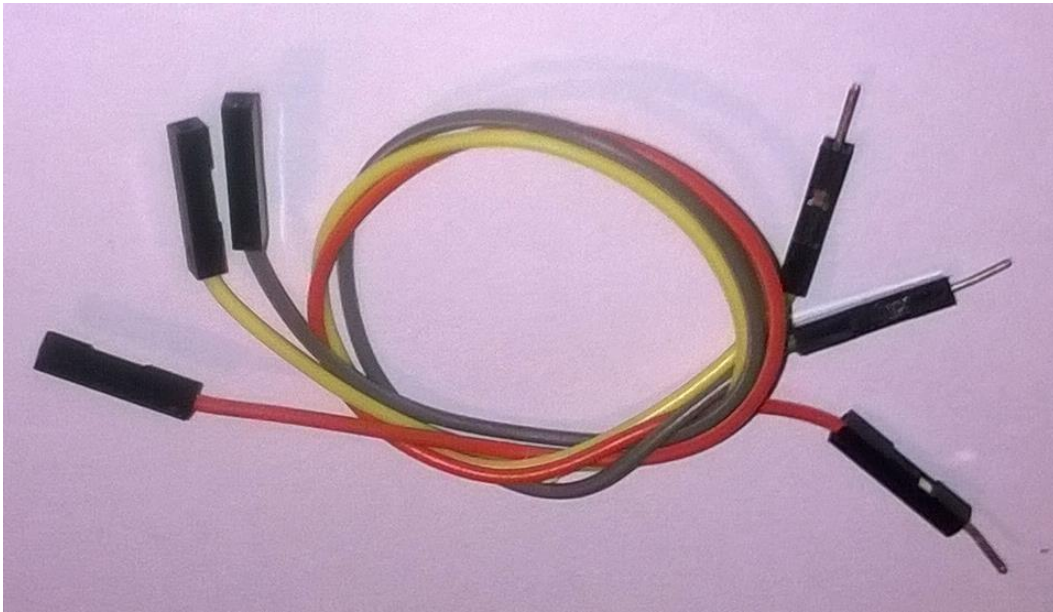


Pinwheel attached inside the water flow sensor

Wiring the water flow sensor with Arduino

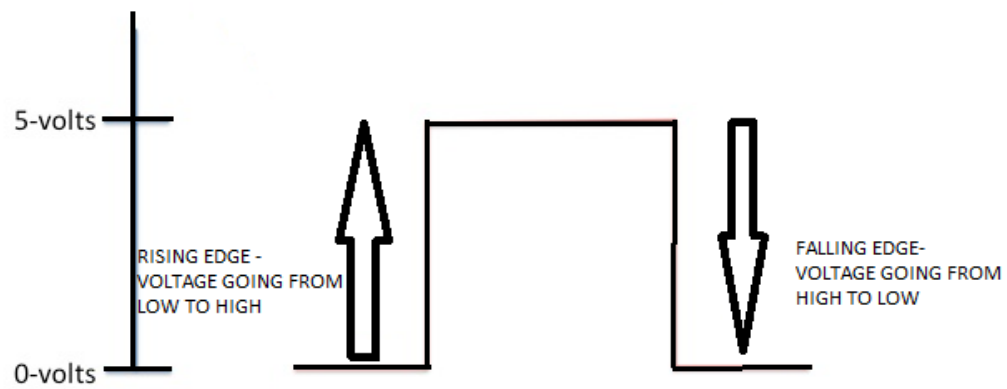


Water flow sensor connected with Arduino Ethernet Shield using three wires



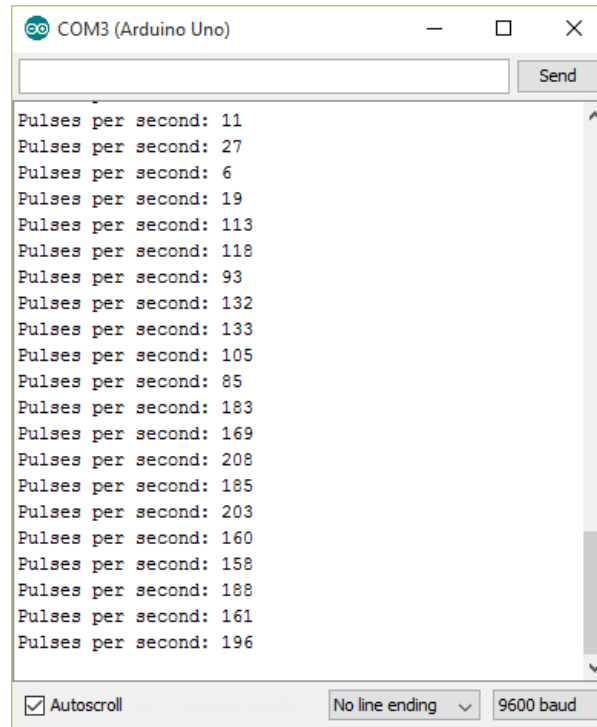
Jumper wires with male and female headers

Rising edge and falling edge



Representation of Rising edge and Falling edge in digital signal

Reading and counting pulses with Arduino



The screenshot shows the serial monitor window for COM3 (Arduino Uno). The window title is "COM3 (Arduino Uno)". The main area displays a list of pulse counts per second: 11, 27, 6, 19, 113, 118, 93, 132, 133, 105, 85, 183, 169, 208, 185, 203, 160, 158, 188, 161, and 196. The window includes a "Send" button, an "Autoscroll" checkbox (checked), a "No line ending" dropdown menu, and a "9600 baud" dropdown menu.

```
COM3 (Arduino Uno)
Pulses per second: 11
Pulses per second: 27
Pulses per second: 6
Pulses per second: 19
Pulses per second: 113
Pulses per second: 118
Pulses per second: 93
Pulses per second: 132
Pulses per second: 133
Pulses per second: 105
Pulses per second: 85
Pulses per second: 183
Pulses per second: 169
Pulses per second: 208
Pulses per second: 185
Pulses per second: 203
Pulses per second: 160
Pulses per second: 158
Pulses per second: 188
Pulses per second: 161
Pulses per second: 196
```

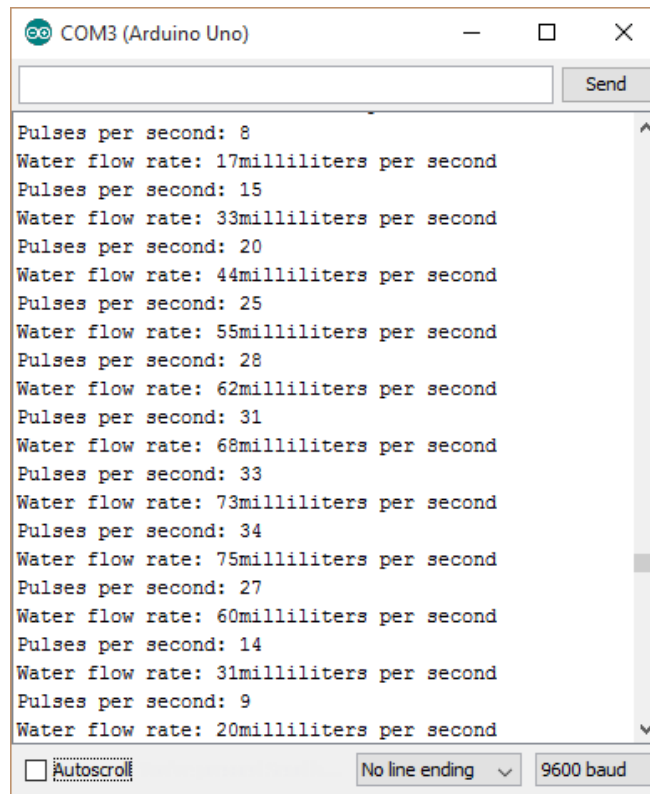
Pulses per second in each loop

Calculating the water flow rate

$$R = \frac{n \text{ (pulse per second)}}{m \text{ (pulse per litre)}}$$

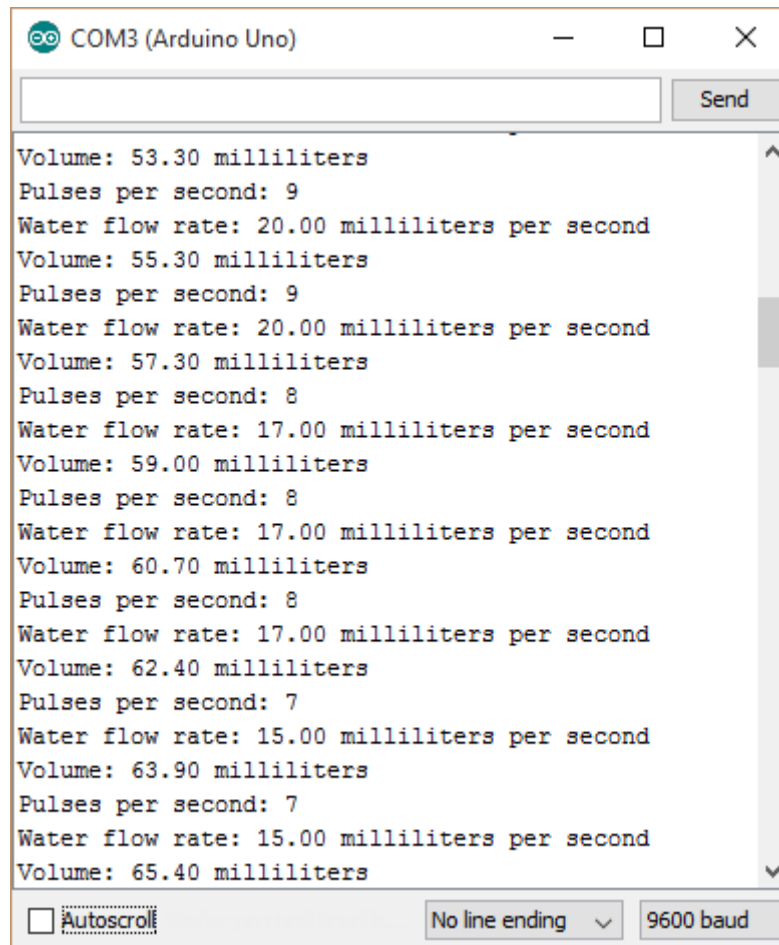
In liters per second

$$R = \frac{n * 60 \text{ (pulse per minute)}}{m \text{ (pulse per litre)}}$$



Pulses per second and water flow rate in each loop

Calculating the water flow volume



```
COM3 (Arduino Uno)
Send
Volume: 53.30 milliliters
Pulses per second: 9
Water flow rate: 20.00 milliliters per second
Volume: 55.30 milliliters
Pulses per second: 9
Water flow rate: 20.00 milliliters per second
Volume: 57.30 milliliters
Pulses per second: 8
Water flow rate: 17.00 milliliters per second
Volume: 59.00 milliliters
Pulses per second: 8
Water flow rate: 17.00 milliliters per second
Volume: 60.70 milliliters
Pulses per second: 8
Water flow rate: 17.00 milliliters per second
Volume: 62.40 milliliters
Pulses per second: 7
Water flow rate: 15.00 milliliters per second
Volume: 63.90 milliliters
Pulses per second: 7
Water flow rate: 15.00 milliliters per second
Volume: 65.40 milliliters
Autoscroll No line ending 9600 baud
```

Pulses per second, water flow rate and in each loop and sum of volume

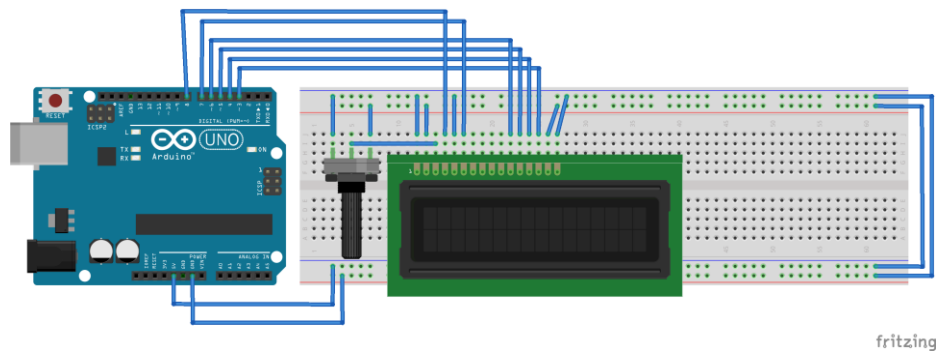
Adding an LCD screen to water meter



Hitachi HD44780 driver compatible LCD screen (16 x 2)—Top View



Hitachi HD44780 driver compatible LCD screen (16x2)—Bottom View



Fritzing representation of the circuit



LCD screen output

Converting your water meter to a web server

A little bit about plumbing



BNC pipe line connector made by PVC



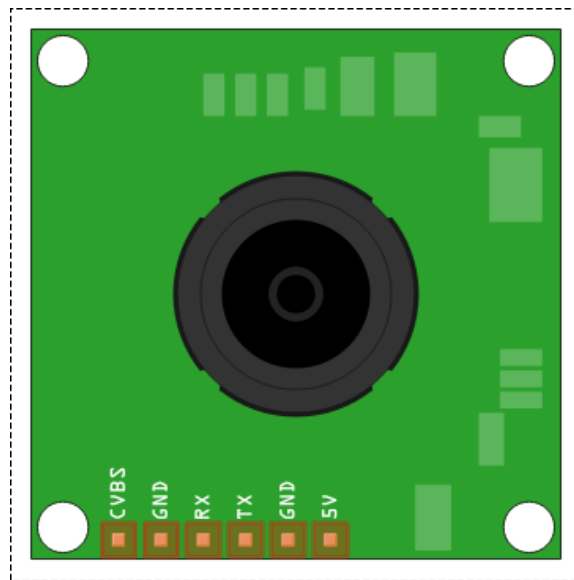
Securing the connection between water flow meter and BNC pipe connector using thread seal



Image taken from <https://www.flickr.com/photos/ttrimm/7355734996/>

Chapter 4: Arduino Security Camera with Motion Detection

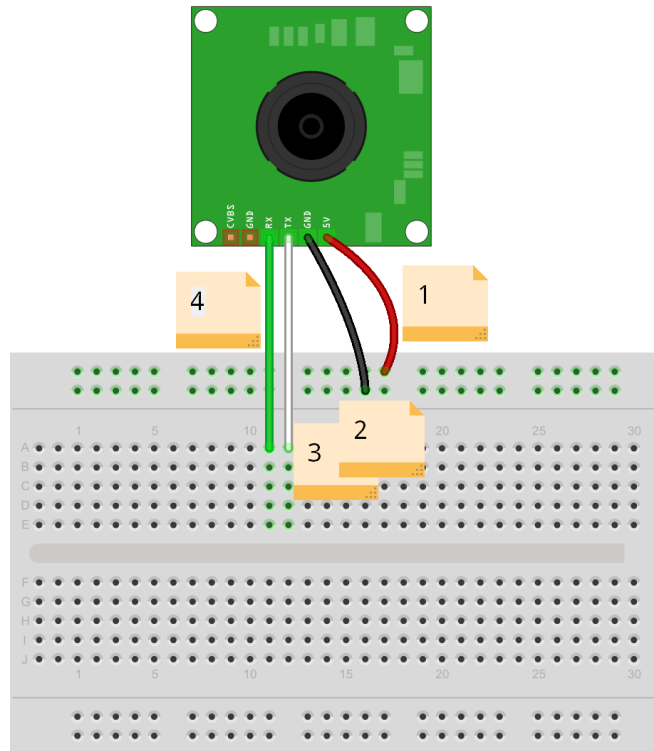
Getting started with TTL Serial Camera



fritzing

Fritzing representation of TTL Serial Camera—Top View

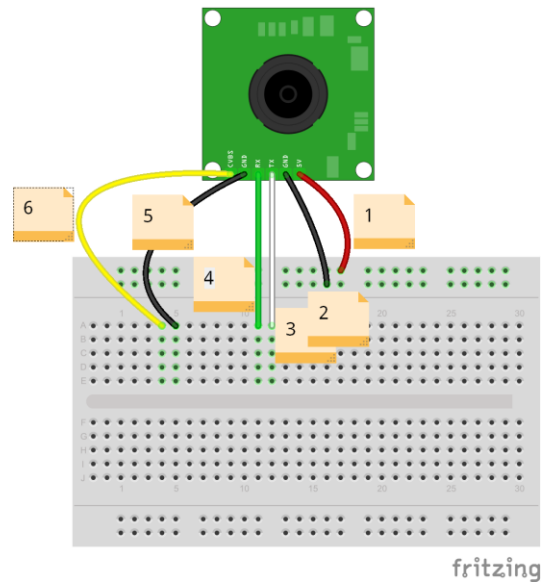
Wiring the TTL Serial Camera for image capturing



fritzing

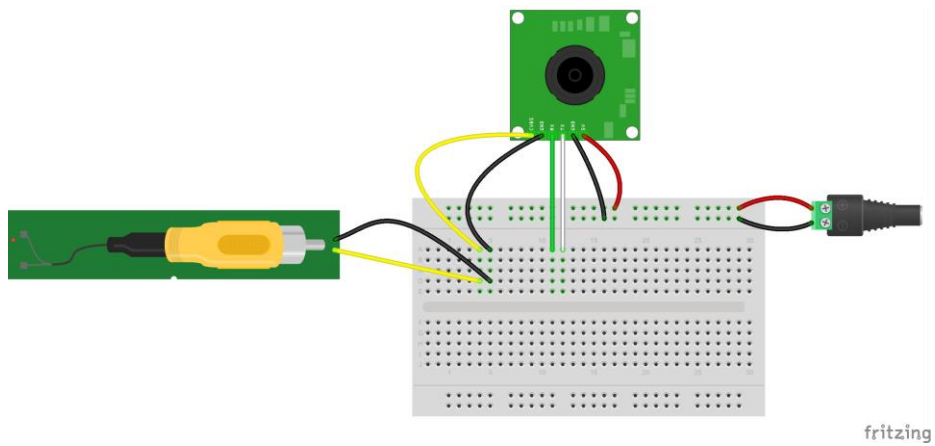
Wiring for image capturing in the JPEG format

Wiring the TTL Serial Camera for video capturing

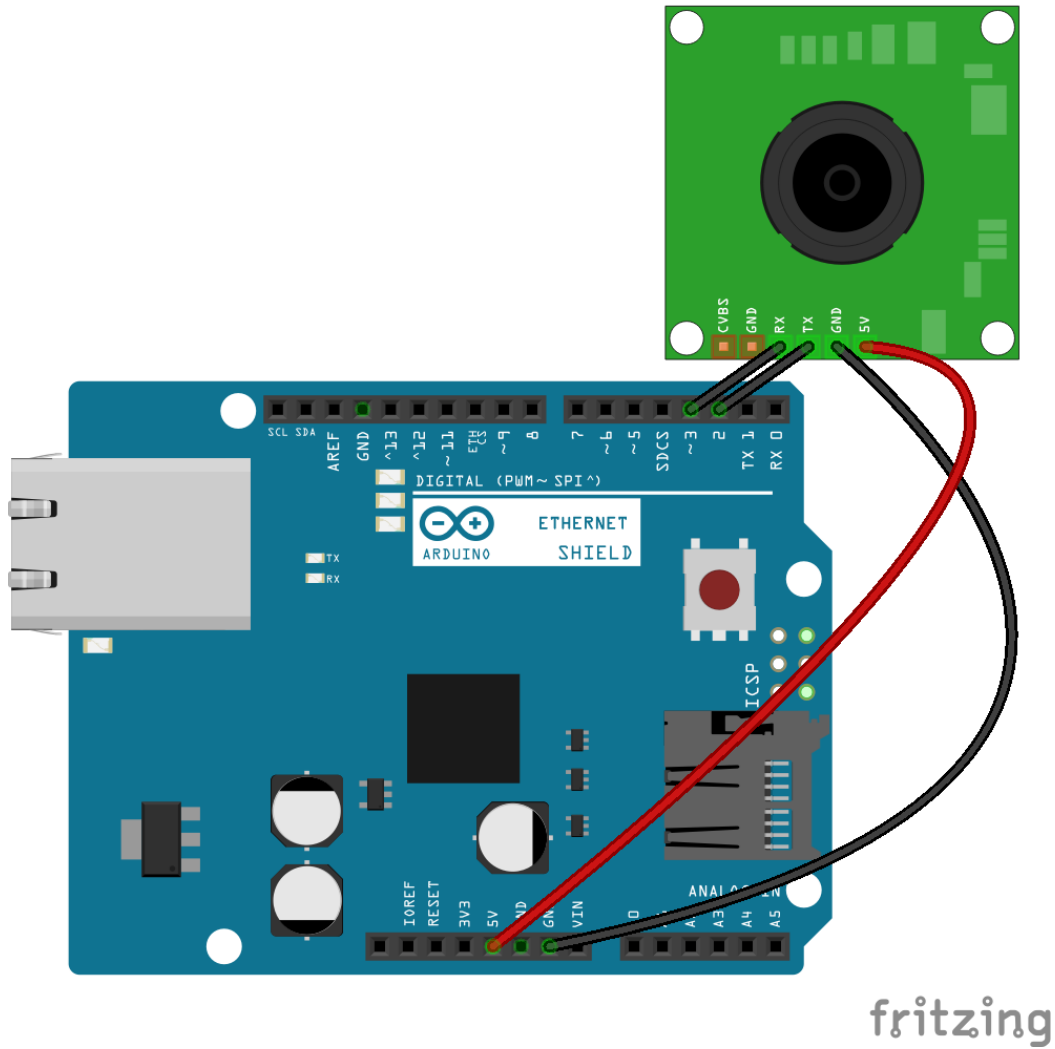


Wiring for video capturing with NTSC monochrome

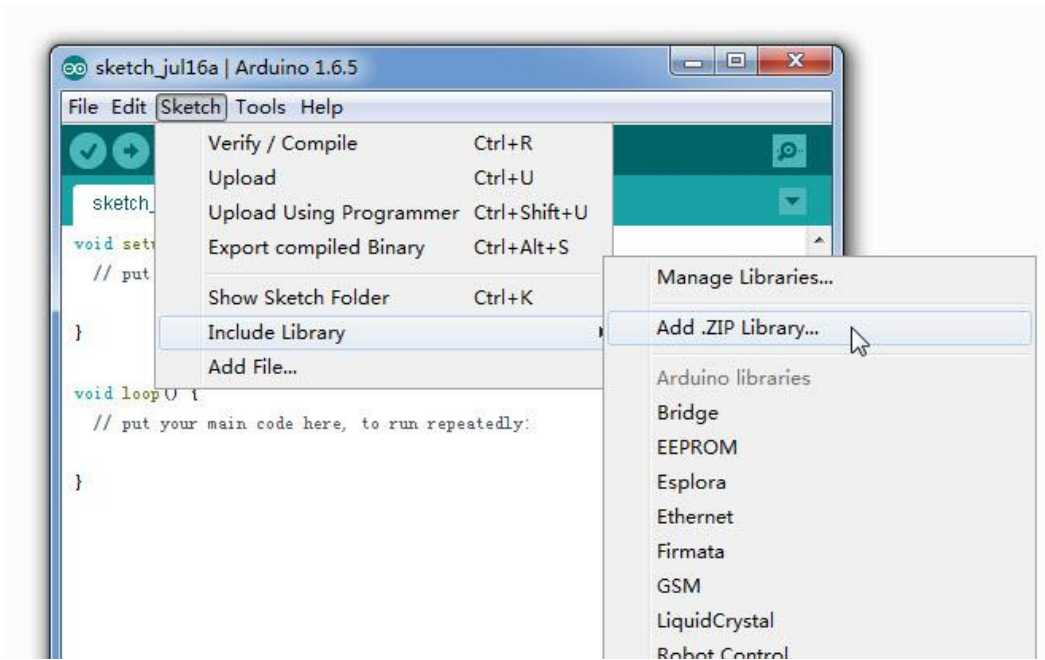
Testing NTSC video stream with video screen



Connecting TTL Serial Camera with Arduino and Ethernet Shield



Adafruit VC0706 Serial JPEG Camera is connected with Arduino Ethernet Shield

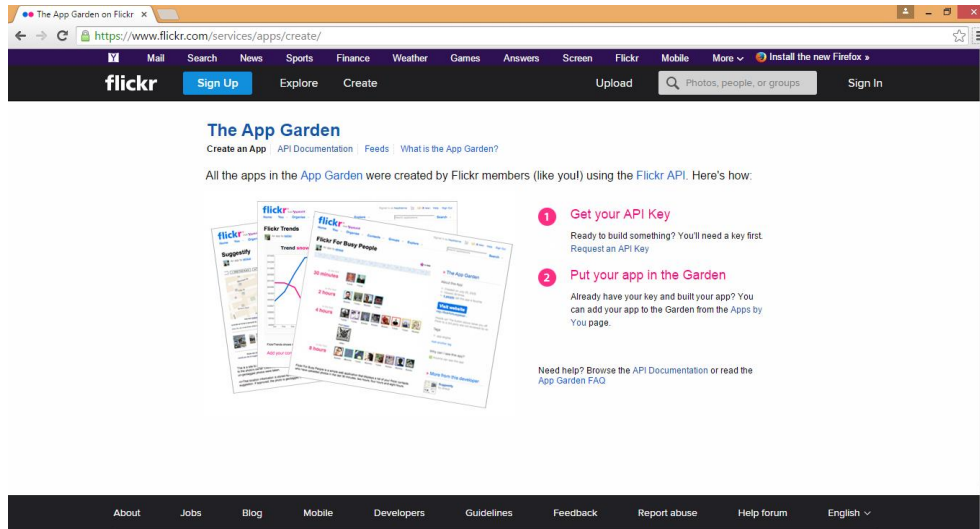


Including new library by a ZIP file

Uploading images to Flickr

Creating a Flickr account

:



Flickr: The App Garden page

The App Garden

[Create an App](#) [API Documentation](#) [Feeds](#) [What is the App Garden?](#)

All the apps in the [App Garden](#) were created by Flickr members (like you!) using the [Flickr API](#). Here's how:



Flickr: The App Garden page

The App Garden

[Create an App](#) | [API Documentation](#) | [Feeds](#) | [What is the App Garden?](#)

First, we need to know whether or not your app is commercial.

<p>Choose Non-Commercial if:</p> <ul style="list-style-type: none">• Your app doesn't make money.• Your app makes money, but you're a family-run, small, or independent business.• You're developing a product which is not currently commercial, but might be in the future.• You're building a personal website or blog where you are only using your own images. <p>APPLY FOR A NON-COMMERCIAL KEY</p>	or	<p>Choose Commercial if:</p> <ul style="list-style-type: none">• You or your agency works for a major brand. <p>AND one of the following:</p> <ul style="list-style-type: none">• You want to make a profit.• You charge a fee for your product or services.• You will bring Flickr content into your product and intend to sell those services. <p>APPLY FOR A COMMERCIAL KEY</p>
---	-----------	---

Flickr: The App Garden page

Tell us about your app:

Owner `pradeeka.seneviratne`

This app will be associated with your `pradeeka.seneviratne` account. You will not be able to change this after you submit your application.

What's the name of your app?

What are you building?
(And trust us when we say you can't be detailed enough)

I acknowledge that Flickr members own all rights to their content, and that it's my responsibility to make sure that my project does not contravene those rights.

I agree to comply with the [Flickr API Terms of Use](#).

or [Cancel](#)

Flickr: The App Garden page

The App Garden

[Create an App](#) | [API Documentation](#) | [Feeds](#) | [What is the App Garden?](#)

Done! Here's the API key and secret for your new app:



photo uploading with temboo

Key:

4cf01248c47 **09111a10f**

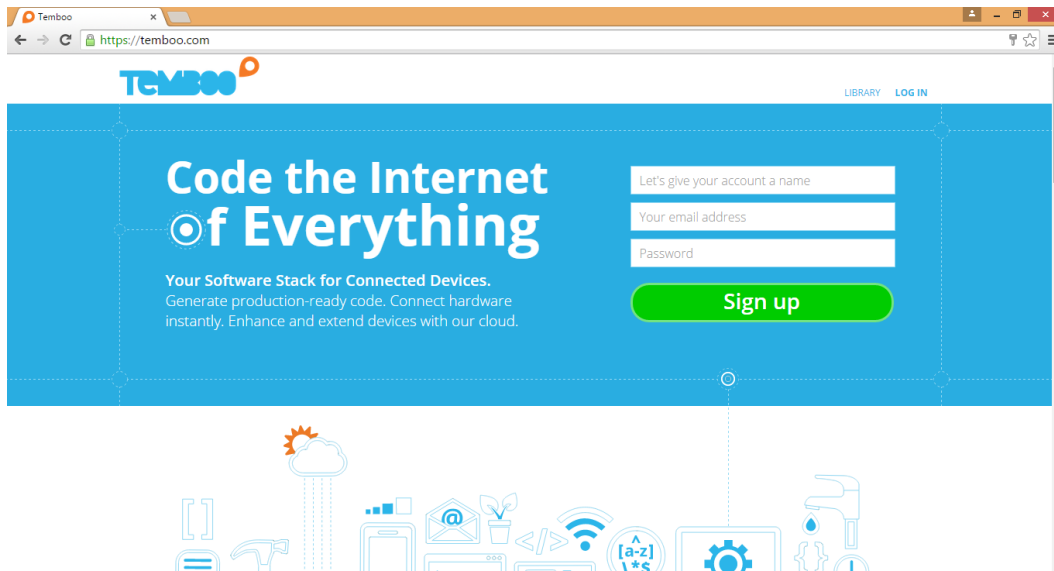
Secret:

0c49d **3c84**

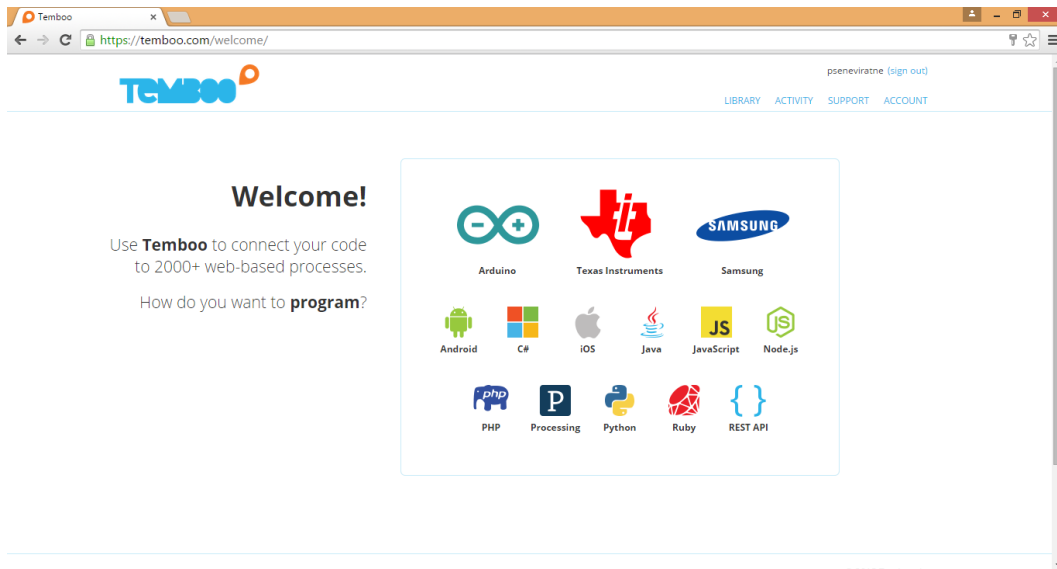
[Edit app details](#) - [Edit auth flow for this app](#) - [View all Apps by You](#)

Flickr: The App Garden page

Creating a Temboo account



Temboo home page



Temboo Welcome page

Creating your first Choreo

Initializing OAuth

Arduino ethBoard

Want to stream sensor data?

Flickr . OAuth . InitializeOAuth ☆

Generates an authorization URL that an application can use to complete the first step in the OAuth process.

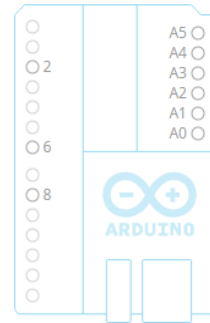
+ Is this Choreo triggered by a sensor event?

INPUT flickr

APIKey
The API Key provided by Flickr (AKA the OAuth Consumer Key).


5-7-5702511-571-2-01-202-82722

IoT Mode ON



Enabling IoT mode


 Arduino ▼

 How is it connected? ▼


 Want to stream sensor data? ▼


Flickr . OAuth . **InitializeOAuth** ☆

Generates an authorization URL that an application can use to complete the first step in the OAuth process.

 **Is this Choreo triggered by a sensor event?**

INPUT

 **APIKey**
The API Key provided by Flickr (AKA the OAuth Consumer Key).

 **APISecret**
The API Secret provided by Flickr (AKA the OAuth Consumer Secret).

▶ OPTIONAL INPUT

Run 

Initialize OAuth for Flickr

✕

Tell us about your shield

Name

Shield Type Arduino Ethernet ▼

MAC Address ex: 1A2B3C4D5E6F

Find this on the bottom of your shield.

Cancel Save

Tell us about your shield dialog box

The App Garden

[Create an App](#) | [API Documentation](#) | [Feeds](#) | [What is the App Garden?](#)

Done! Here's the API key and secret for your new app:




photo uploading with temboo

Key:
4cf01248c47 09111a10f

Secret:
0c49d 3c84

[Edit app details](#) - [Edit auth flow for this app](#) - [View all Apps by You](#)

Abc **AuthorizationURL**

The authorization URL that the application's user needs to go to in order to grant access to your application.

```
http://www.flickr.com/services/oauth/authorize?oauth_callback_confirmed=true&oauth_token=721576557[REDACTED]951&oauth_token_secret=af287[REDACTED]6b5
```

Visit this URL and grant your application access to your Flickr data. When you see a blank page, you can run the [FinalizeOAuth](#) Choreo.

COPY

Abc **CallbackID**

An ID used to retrieve the callback data that Temboo stores once your application's user authorizes.

```
3991fb6b[REDACTED]d2ec4
```

Save this CallbackID - you'll need it to run the [FinalizeOAuth](#) Choreo.

COPY

Abc **OAuthTokenSecret**

The temporary OAuth Token Secret that can be exchanged for permanent tokens using the [FinalizeOAuth](#) Choreo.

```
af2[REDACTED]b5
```

Save this OAuthTokenSecret - you'll need it to run the [FinalizeOAuth](#) Choreo.

COPY

Output after the process of OAuth Initialization for Flickr

:



Hi pradeeka.seneviratne

photo uploading with temboo wants to link to your Flickr account.

This is a third-party service. If you don't trust it with access to your account, then you should not authorize it.

By authorizing this link, you'll allow **photo uploading with temboo** to:

- ✓ **Access** your Flickr account (including private content)
- ✓ **Upload, Edit, and Replace** photos and videos in your account
- ✓ **Interact** with other members' photos and videos (comment, add notes, favorite)

photo uploading with temboo will not have permission to:

- ✗ **Delete** photos and videos from your account

OK, I'LL AUTHORIZE IT NO THANKS

What's going on here?

Flickr encourages other developers to build cool tools for you to play with, but you must authorize these third parties to access your account.

Want to know more?

A wealth of information lies within the [Flickr Services](#) page.

Flicker user account authorization page

Finalizing OAuth

INPUT Select Profile ▼

ApiKey
The API Key provided by Flickr (AKA the OAuth Consumer Key).

APISecret
The API Secret provided by Flickr (AKA the OAuth Consumer Secret).

CallbackID
The callback token returned by the InitializeOAuth Choreo. Used to retrieve the callback data after the user authorizes.

OAuthTokenSecret
The OAuth Token Secret retrieved during the OAuth process. This is returned by the InitializeOAuth Choreo.

▶ **OPTIONAL INPUT**

Run ↻

FinalizeOAuth for Flickr

Generating the photo upload sketch

Arduino Want to stream sensor data?

Flickr . Photos . Upload ☆

Uploads a photo to Flickr.

+ Is this Choreo triggered by a sensor event?

INPUT

AccessToken
The Access Token retrieved during the OAuth process.

AccessTokenSecret
The Access Token Secret retrieved during the OAuth process.

APIKey
The API Key provided by Flickr (AKA the OAuth Consumer Key).

APISecret
The API Secret provided by Flickr (AKA the OAuth Consumer Secret).

ImageFileContents
The base-64 encoded file contents to upload. Required unless using the URL input.

URL
A url for a photo to upload to Flickr. Required unless specifying the ImageFileContents.

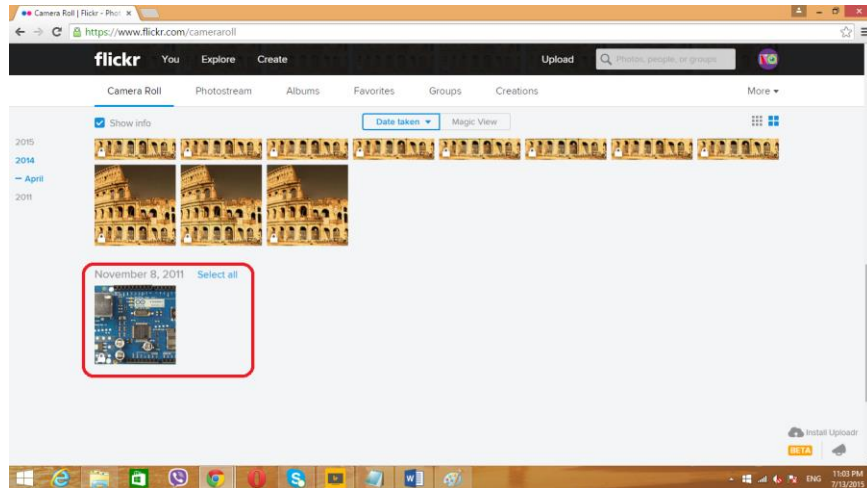
▶ **OPTIONAL INPUT**

Flickr photo upload Choreo

★ Response

The response from Flickr.

```
["stat":"ok","photoid":"19395289079"]
```



▼ CODE

Download

```

/* Setup shield-specific #include statements */
#include <SPI.h>
#include <Dhcp.h>
#include <Dns.h>
#include <Ethernet.h>
#include <EthernetClient.h>
#include <Temboo.h>
#include "TembooAccount.h" // Contains Temboo account information

byte ethernetMACAddress[] = ETHERNET_SHIELD_MAC;
EthernetClient client;

int numRuns = 1; // Execution count, so this doesn't run forever
int maxRuns = 10; // Maximum number of times the Choreo should be executed

void setup() {
  Serial.begin(9600);

```

▼ HEADER FILE

```

/*
IMPORTANT NOTE about TembooAccount.h

TembooAccount.h contains your Temboo account information and must be included
alongside your sketch. To do so, make a new tab in Arduino, call it TembooAccount.h,
and copy this content into it.
*/

#define TEMBOO_ACCOUNT "pradeeka" // Your Temboo account name
#define TEMBOO_APP_KEY_NAME "myFirstApp" // Your Temboo app key name
#define TEMBOO_APP_KEY "49ad[REDACTED]1a03" // Your Temboo app key

#define ETHERNET_SHIELD_MAC [REDACTED]

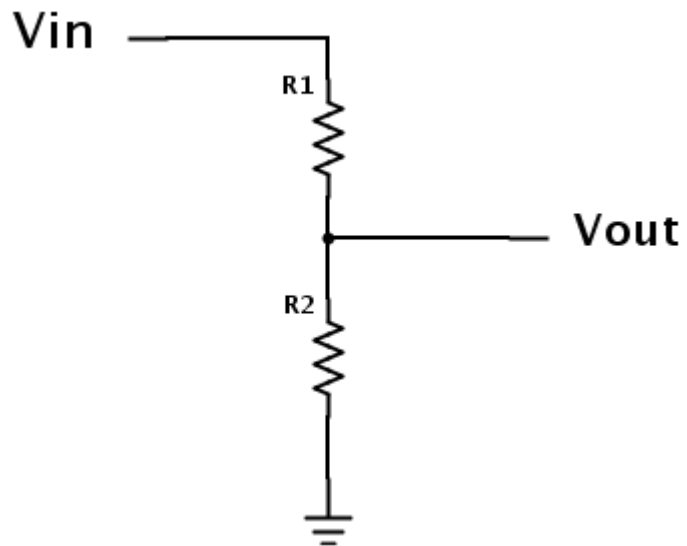
/*
The same TembooAccount.h file settings can be used for all Temboo SDK sketches.
Keeping your account information in a separate file means you can share the
main .ino file without worrying that you forgot to delete your credentials.

```

Chapter 5: Solar Panel Voltage Logging with NearBus Cloud Connector and Xively

Connecting a solar cell with the Arduino Ethernet board

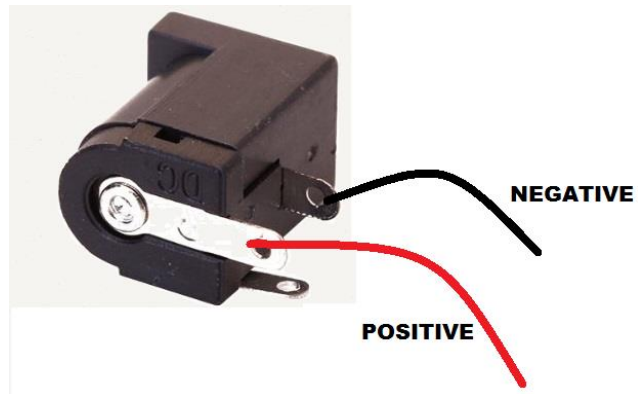
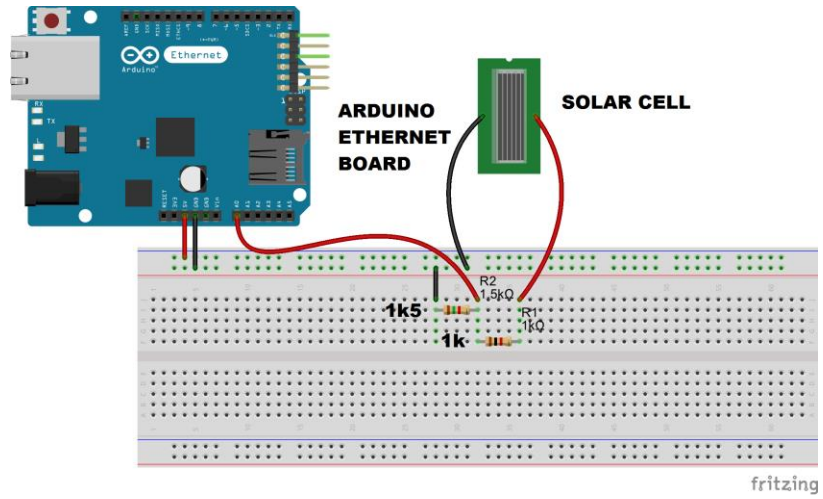
Building a voltage divider





$$V_{out} = V_{in} \cdot \frac{R_2}{R_1 + R_2}$$

Building the circuit with Arduino



Defining a new device

NEW DEVICE SETUP

PARAMETER	VALUE
DEVICE NAME	<input type="text"/>
LOCATION	<input type="text"/>
FUNCTION	<input type="text"/>
SHARED SECRET	<input type="text"/>
PIN	<input type="text"/>
CALLBACK SERVICE	<input type="text"/>
DEVICE IDENTIFIER	<input type="text"/>
DEFAULT REFRESH RATE [ms]	<input type="text" value="2000"/>

CONFIGURED AS VMCU

Examining the device lists

DEVICES LIST

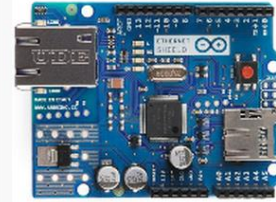
DEVICE ID	DEVICE ALIAS	STATE	SELECT
NB101706	Arduino Ethernet	DOWN	<input type="radio"/>

Downloading the NearBus agent

NearBus Library for Arduino - Alpha Release:

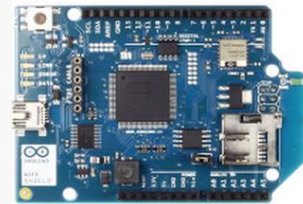
Arduino library for Ethernet - Alpha Release - (this release requires the **FlexiTimer2** library installation)

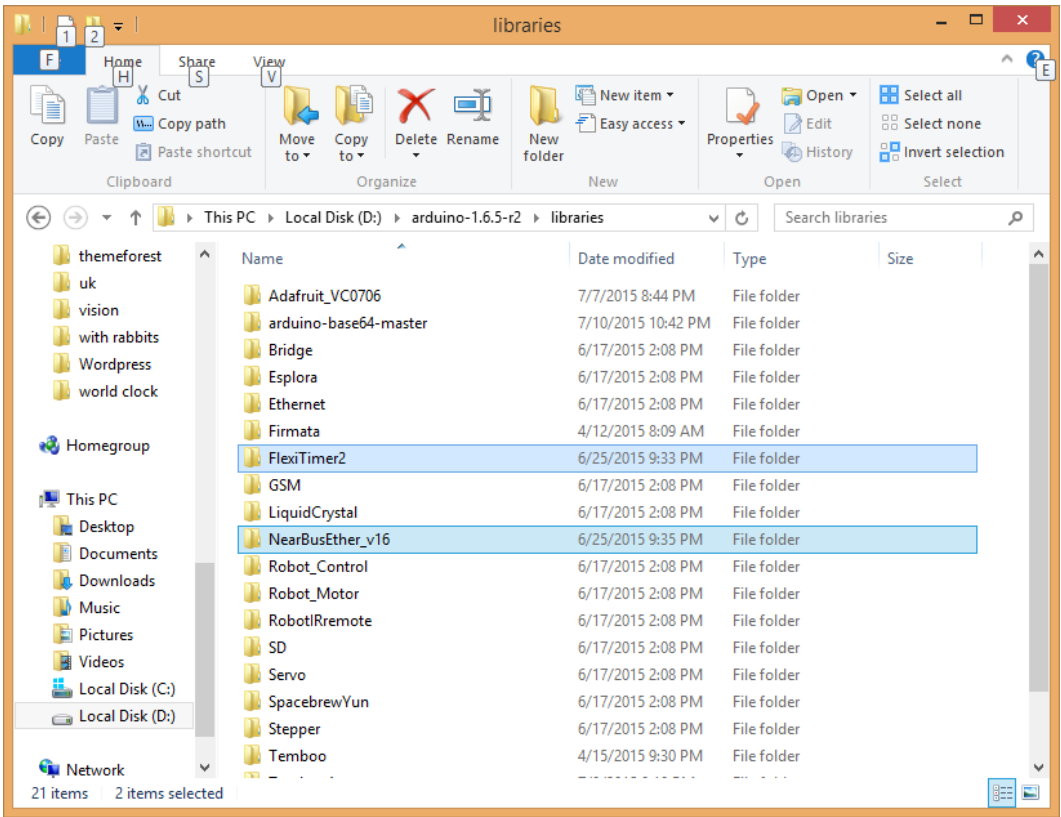
NearBusEther_v16.zip



Arduino library for WiFi - Alpha Release - (this release requires the **FlexiTimer2** library installation) - **IMPORTANT: It DOES NOT work with Arduino IDE 1.5.5 (Beta)**

NearBusWiFi_v15.zip



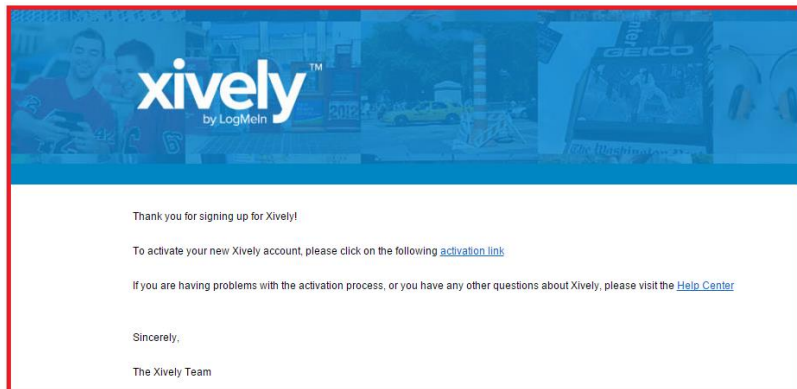
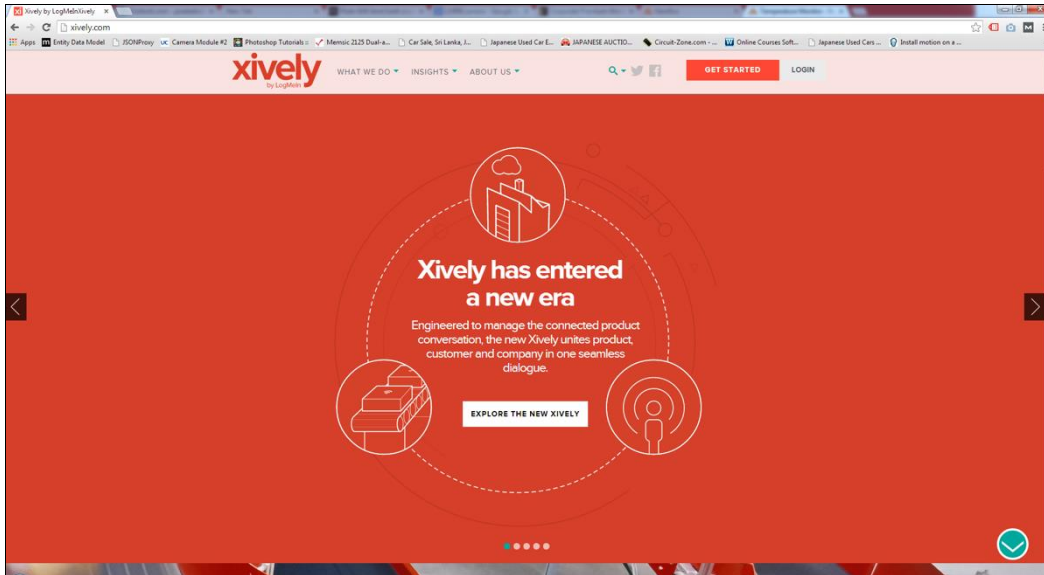




DEVICES LIST

DEVICE ID	DEVICE ALIAS	STATE	SELECT
NB101706	Arduino Ethernet	UP	<input type="radio"/>

CONFIG DEVICE ▼
Setup

Creating and configuring a Xively account




xively DEVELOP MANAGE SETTINGS DEVELOPER CENTER * LOGOUT   **pradeep**

Thanks for activating your account. Try clicking one of the links below to start using the site.

Welcome to Xively

Take the Test Drive

A 5 minute tutorial to get familiar with all the basics from connecting one device to building interconnected systems and apps.



What you'll learn

- ✓ How to setup a **development device** through the Xively workbench.
- ✓ How to make your phone a **connected device**.
- ✓ See Xively **bi-directional communication** in action, controlling your devices and communicating between devices and apps.

Try Xively today, all you need is a smartphone and a computer!

[Take Test Drive](#)

[Skip the Test Drive](#)


Already familiar with Xively?

[Get started right away](#) or be inspired by our libraries, tested hardware solutions or learn more about our [Xively API](#).

<> Development Devices

Prototype, experiment, research. [more](#)

[+ Add Device](#)



Start connecting devices

Roll up your sleeves and bring your idea to life by adding your first device.

- [Take the Xively Test Drive](#)
- [Connect an mbed](#)
- [Connect an Electric Imp](#)
- [Connect an Arduino](#)
- [Connect a Raspberry Pi](#)

<> Add Device

The Xively Developer Workbench will help you to get your devices, applications and services talking to each other through Xively. The first step is to create a development device. Begin by providing some basic information:

Device Name

e.g My Device

Device Description optional

Tell us more about this device

Privacy You own your data, we help you share it. [more info](#)

Private Device

You use API keys to choose if and how you share a device's data.

Public Device

You agree to share a device's data under the [CC0 1.0 Universal license](#). The Device's data is indexed by major search engines, and its Feed page is publicly viewable.

✓ Add Device

Cancel

Add Channels to your Device!

Start sending data to Xively



Channels Last updated 8 minutes ago

 Graphs

[+ Add Channel](#)

Location

 [Add location](#)

Metadata



Tags
Description
Created 14:47:29 +0530
Creator pradeeka
Website
Email

Channels Last updated 14 minutes ago N Graphs

Add Channel ID required

Tags <small>Use a comma to separate tags.</small>	Units	Symbol
<input type="text" value="e.g. energy, project:name=my_pr"/>	<input type="text" value="e.g. Watts"/>	<input type="text" value="e.g. W"/>

Current Value

API Keys

Auto-generated Voltage Logger device key for feed
193539282

JqhAooowxcyFOCxG0 [REDACTED] Upr8LPPYpkr

permissions READ,UPDATE,CREATE,DELETE

private accesss

[+ Add Key](#)

Configuring the NearBus connected device for Xively

DEVICES LIST

DEVICE ID	DEVICE ALIAS	STATE	SELECT
NB101706	Arduino Ethernet	DOWN	<input type="radio"/>

COSM CONFIG ▼

- CONFIG DEVICE
- EDIT DEVICE
- COSM CONFIG
- DEVICE MONITOR
- TWITTER CONFIG
- GOOGLE CONFIG
- X-CONTROL
- NMAIL CONFIG
- GEO_LOCATION

IMPORTANT: To setup a new Arduino Ethernet board please follow the steps shown in the [Hello World](#) example.

COSM CONNECTOR (xively.com)

Arduino Ethernet	DOWN
MODE	TRNSP

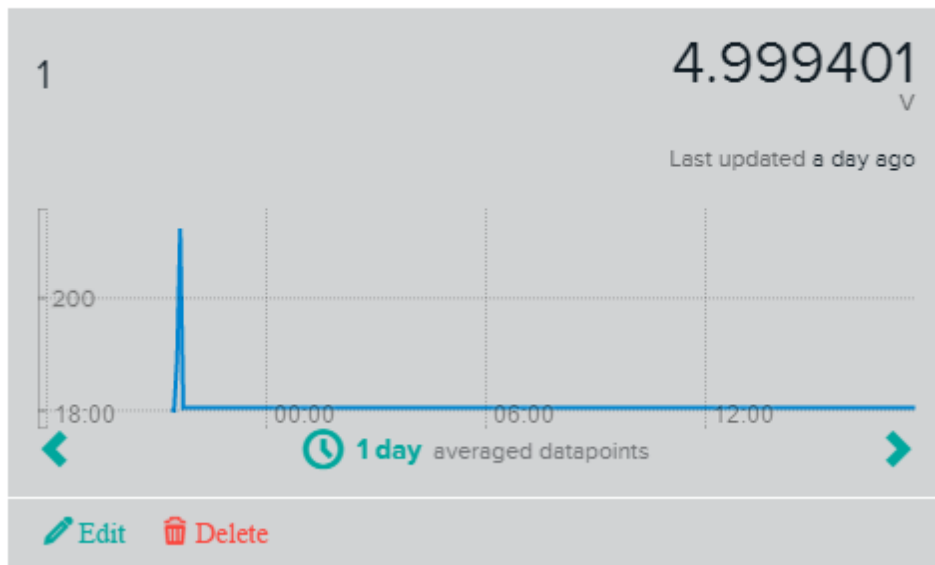
CHANNEL	STREAM ID	IN [A]	OUT [B]	Const [K]	Offset	ON
Channel 00	1	<input checked="" type="radio"/>	<input type="radio"/>	0.004887	0	<input checked="" type="checkbox"/>
Channel 01		<input type="radio"/>	<input type="radio"/>	1	0	<input type="checkbox"/>
Channel 02		<input type="radio"/>	<input type="radio"/>	1	0	<input type="checkbox"/>
Channel 03		<input type="radio"/>	<input type="radio"/>	1	0	<input type="checkbox"/>
Channel 04		<input type="radio"/>	<input type="radio"/>	1	0	<input type="checkbox"/>
Channel 05		<input type="radio"/>	<input type="radio"/>	1	0	<input type="checkbox"/>
Channel 06		<input type="radio"/>	<input type="radio"/>	1	0	<input type="checkbox"/>
Channel 07		<input type="radio"/>	<input type="radio"/>	1	0	<input type="checkbox"/>

COSM FEED	1910481586
COSM API KEY	GE0sSoyHzIZ3PZhtYKBP99ioKPWIHqb7adMU,

Setup

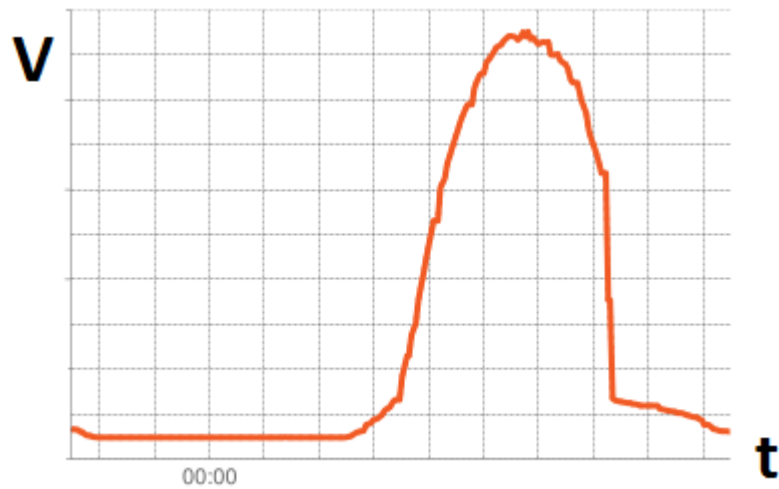
Channels Last updated a day ago

 Graphs



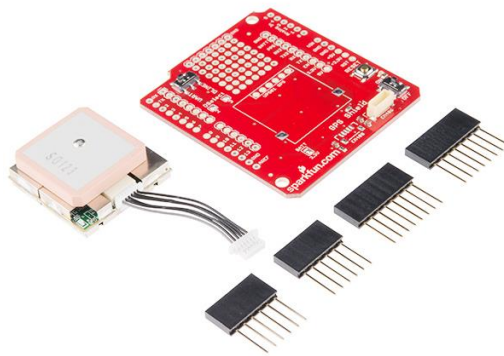
Developing a web page to display the real-time voltage values

Displaying data on a web page



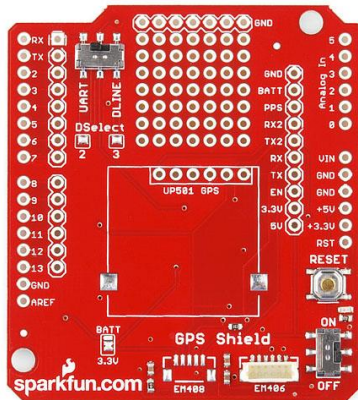
Chapter 6: GPS Location Tracker with Temboo, Twilio, and Google Maps

Getting started with Arduino GPS shield



Arduino GPS Shield Kit: Image taken from SparkFun Electronics

Connecting the Arduino GPS shield with the Arduino Ethernet board



Arduino GPS Shield PCB: Image taken from SparkFun Electronics

Testing the GPS shield

```
Location: 42.120616,-88.330108 Date/Time: 2/24/2015 17:37:49.00
Location: 42.120616,-88.330108 Date/Time: 2/24/2015 17:37:50.00
Location: 42.120616,-88.330108 Date/Time: 2/24/2015 17:37:50.00
Location: 42.120616,-88.330108 Date/Time: 2/24/2015 17:37:50.00
Location: 42.120616,-88.330108 Date/Time: 2/24/2015 17:37:51.00
Location: 42.120616,-88.330108 Date/Time: 2/24/2015 17:37:51.00
Location: 42.120616,-88.330108 Date/Time: 2/24/2015 17:37:51.00
Location: 42.120616,-88.330108 Date/Time: 2/24/2015 17:37:51.00
```

Display the current location on Google Maps



The current location of the Arduino GPS Shield is displayed on the Google Map with a marker icon


Getting started with Twilio

Creating a Twilio account


Get Started with Voice, SMS & MMS ⌵ Show API Credentials

Welcome Pradeeka Seneviratne! Ready to begin?


[Get your Twilio number](#)



Build a Voice App
Make a call with the API Explorer.
Learn how to take **incoming calls with TwiML**.



Build a Messaging App
Send a message with the API Explorer.
Learn how to **reply to incoming messages**.



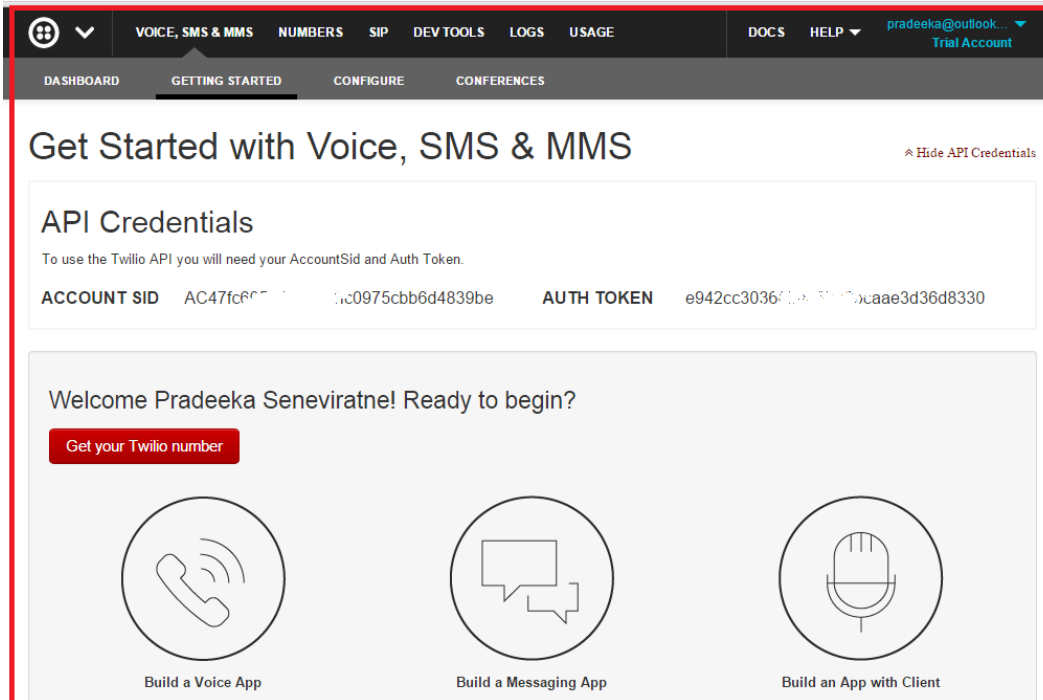
Build an App with Client
Download the **Twilio Client SDKs** for your browser, iOS, or Android.

Helpful Documentation
[Verify or Buy phone numbers](#)
[Download API Libraries and SDKs](#) [↗](#)
[Learn more about how the free trial works](#) [↗](#)

Not ready to build? We can help you find the right solution. [Talk to sales](#) [↗](#)

Twilio getting started page

Finding Twilio LIVE API credentials



The screenshot shows the Twilio dashboard interface. At the top, there is a navigation bar with a logo on the left and menu items: VOICE, SMS & MMS, NUMBERS, SIP, DEV TOOLS, LOGS, USAGE, DOCS, and HELP. The user's name 'pradeeka@outlook...' and 'Trial Account' are visible on the right. Below the navigation bar, there is a sub-navigation bar with 'DASHBOARD', 'GETTING STARTED', 'CONFIGURE', and 'CONFERENCES'. The main content area is titled 'Get Started with Voice, SMS & MMS' and includes a 'Hide API Credentials' link. A section titled 'API Credentials' provides instructions and displays the following information:

ACCOUNT SID	Auth Token
AC47fc6071c0975cbb6d4839be	e942cc3036f0a57f0bcaae3d36d8330

Below this, a welcome message reads 'Welcome Pradeeka Seneviratne! Ready to begin?' followed by a 'Get your Twilio number' button. Three circular icons represent different Twilio services: 'Build a Voice App' (phone handset), 'Build a Messaging App' (speech bubbles), and 'Build an App with Client' (microphone).

Twilio API Credentials: Account SID and Auth Token

Finding Twilio test API credentials

The screenshot shows the Twilio Account Settings page. The top navigation bar includes 'VOICE, SMS & MMS', 'NUMBERS', 'SIP', 'DEV TOOLS', 'LOGS', 'USAGE', 'DOCS', and 'HELP'. The user's name 'Pradeeka Seneviratne' and email 'pradeeka@outlook...' are visible in the top right. The main content area is titled 'Account Settings' and includes sections for 'Account Name', 'Two-Factor Authentication', and 'API Credentials'. The 'API Credentials' section is highlighted with a red border and contains two columns: 'Live' and 'Test'. The 'Live' column shows 'AccountSID' (AC47fc60[redacted]839be) and 'AuthToken (Request a Secondary Token)'. The 'Test' column shows 'Test AccountSID' (AC4bb876[redacted]c1b3a225) and 'Test AuthToken'.




Environment	AccountSID	AuthToken
Live	AC47fc60[redacted]839be	(Request a Secondary Token)
Test	AC4bb876[redacted]c1b3a225	Test AuthToken

Twilio Test API Credentials: Test Account SID and Test Auth Token

Get your Twilio number

Get Started with Voice, SMS & MMS Show API Credentials

Your first Twilio phone number.

+1 (913) 376-1232   

Choose this number Don't like this one? [Search for a different number.](#)

Helpful Documentation

- [Meet TwiML: The Twilio Markup Language](#)
- [Which countries does Twilio have numbers in and what are their capabilities?](#)
- [Learn more about how the free trial works](#)

Not ready to build? We can help you find the right solution. [Talk to sales](#)

Ready to remove trial restrictions and enjoy full benefits? [Upgrade your account](#)


[Learn more about trial accounts](#)

Twilio Phone number

Get Started with Voice, SMS & MMS Show API Credentials


Congratulations! Here's your first Twilio number: (913) 376-1232

Configure your number



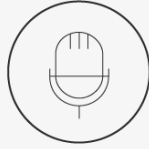
Build a Voice App

Make a call with the API Explorer.
[Learn how to take incoming calls with TwiML.](#)



Build a Messaging App

Send a message with the API Explorer.
[Learn how to reply to incoming messages.](#)



Build an App with Client

Download the Twilio Client SDKs for your browser, iOS, or Android.

Helpful Documentation

- [Verify or Buy phone numbers](#)
- [Download API Libraries and SDKs](#)
- [Learn more about how the free trial works](#)

Twilio Phone number configuration page

Creating Twilio Choreo with Temboo

Sending an SMS with Twilio API

1.

Twilio . SMSMessages . **SendSMS** ☆

Sends an SMS to a specified phone number using the Twilio API.

INPUT

AccountSID
The AccountSID provided when you signed up for a Twilio account.

AuthToken
The authorization token provided when you signed up for a Twilio account.

Body
The text of the message.

From
The purchased Twilio phone number, Twilio Sandbox number, or short code enabled for the type of message you wish to send (SMS or MMS). Format with a '+' and country code e.g., +16175551212.

To
The destination phone number. Format with a '+' and country code e.g., +16175551212.

▶ **OPTIONAL INPUT**

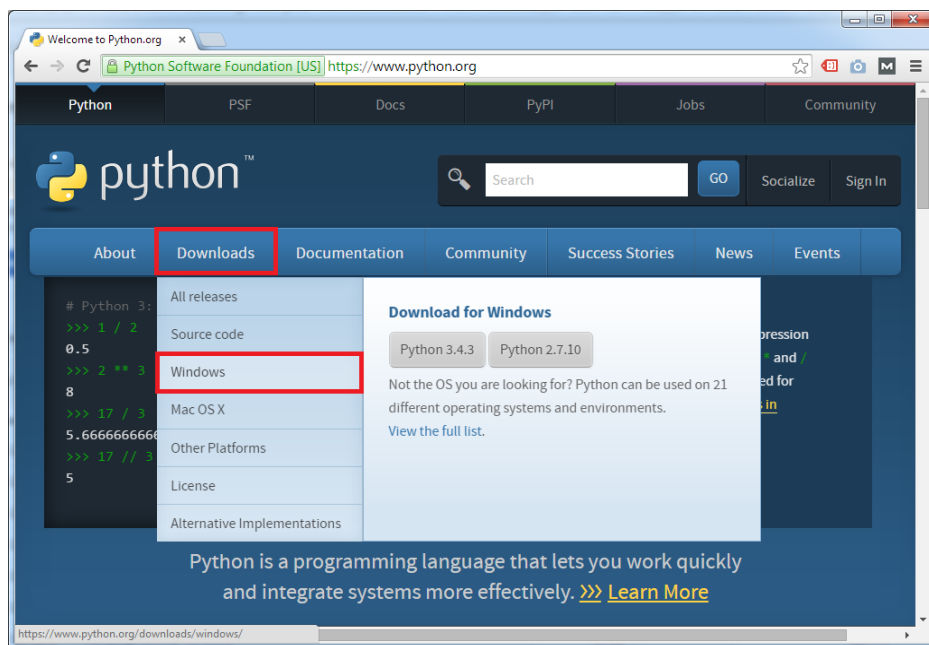
Run ↻

Twilio SendSMS form

Chapter 7: Tweet-a-Light – Twitter-Enabled Electric Light

Getting started with Python

Installing Python on Windows

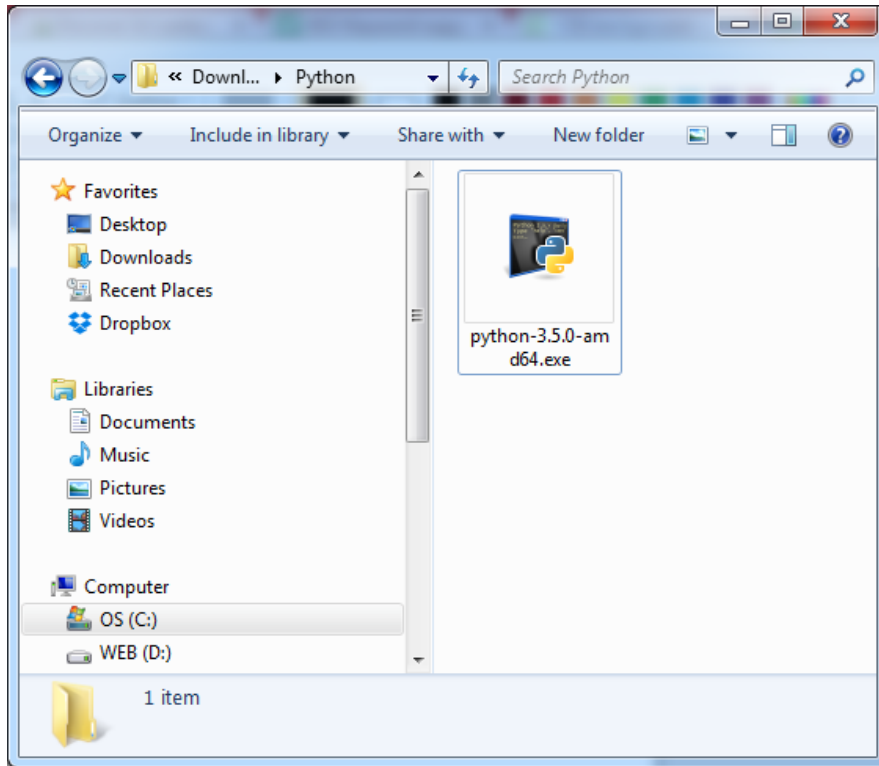


The Python home page

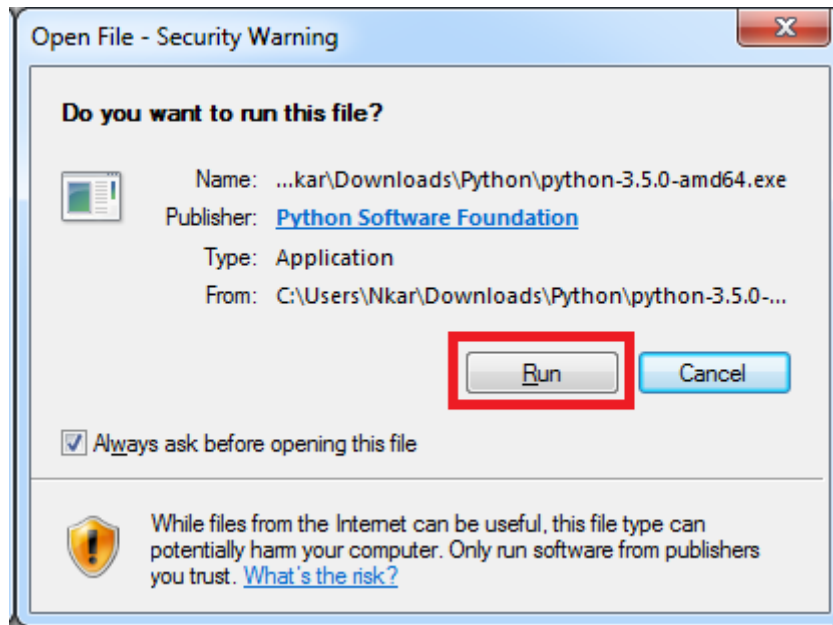
Python Releases for Windows

- [Latest Python 2 Release - Python 2.7.10](#)
- [Latest Python 3 Release - Python 3.5.0](#)
- [Python 3.5.0 - 2015-09-13](#)
 - Download [Windows x86 web-based installer](#)
 - Download [Windows x86 executable installer](#)
 - Download [Windows x86 embeddable zip file](#)
 - Download [Windows x86-64 web-based installer](#)
 - Download [Windows x86-64 executable installer](#)
 - Download [Windows x86-64 embeddable zip file](#)
 - Download [Windows help file](#)

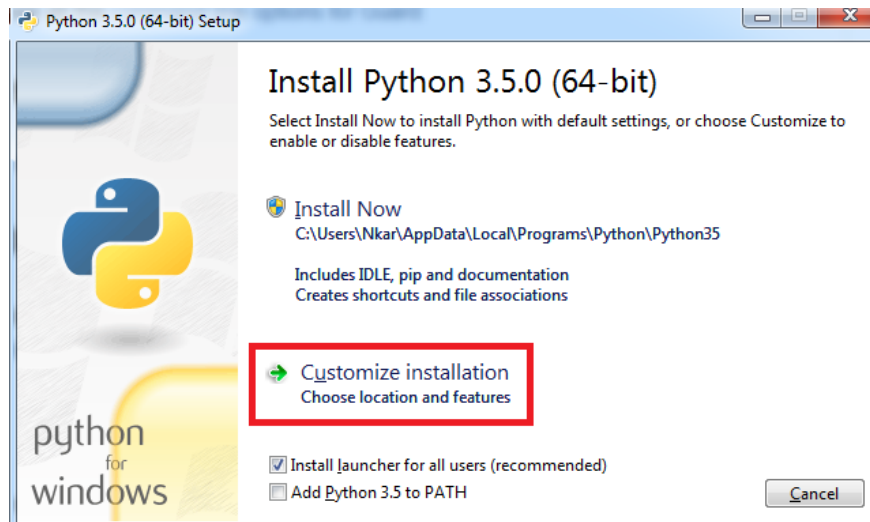
The Python download page



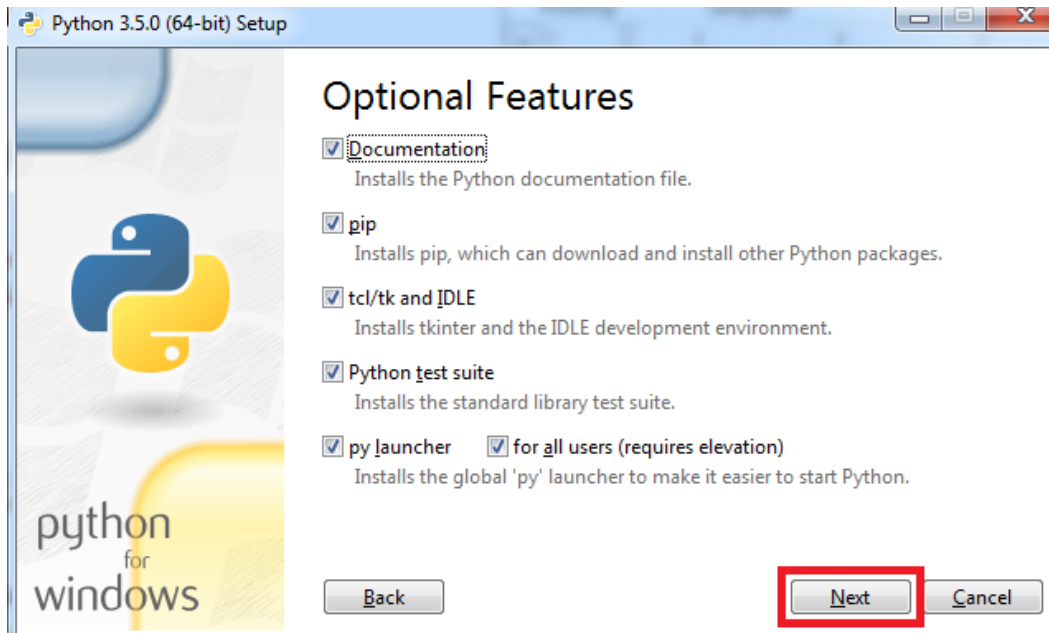
Python setup



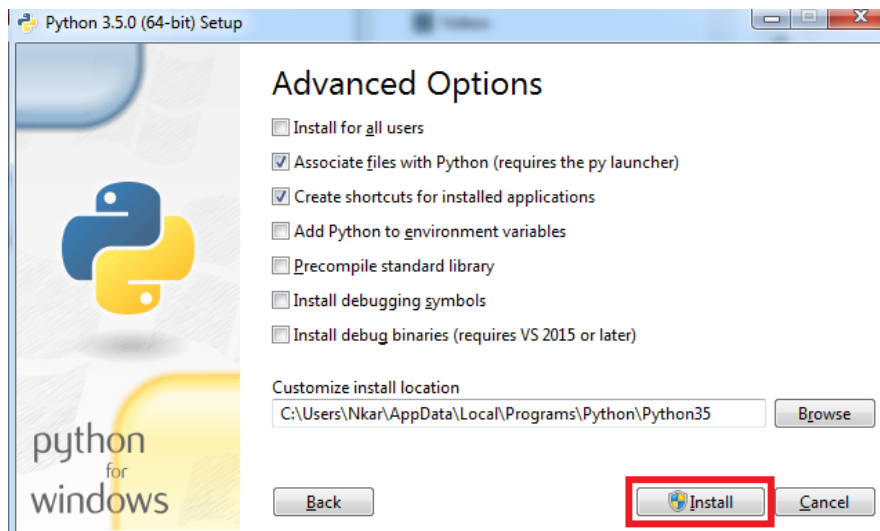
Security warning



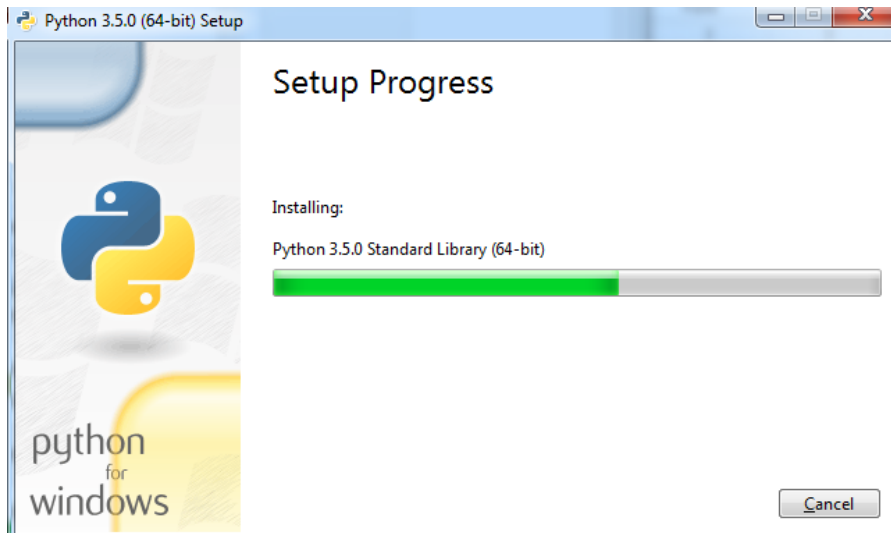
Python setup wizard—Start screen



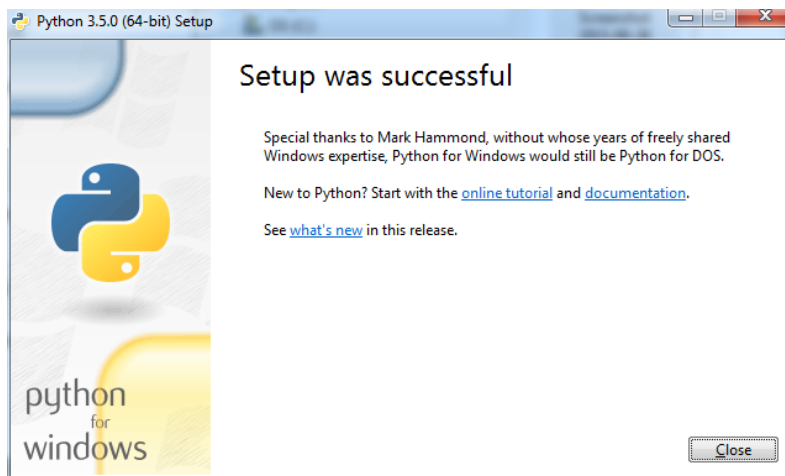
Python setup wizard—Optional Features



Python setup wizard—Advanced Options

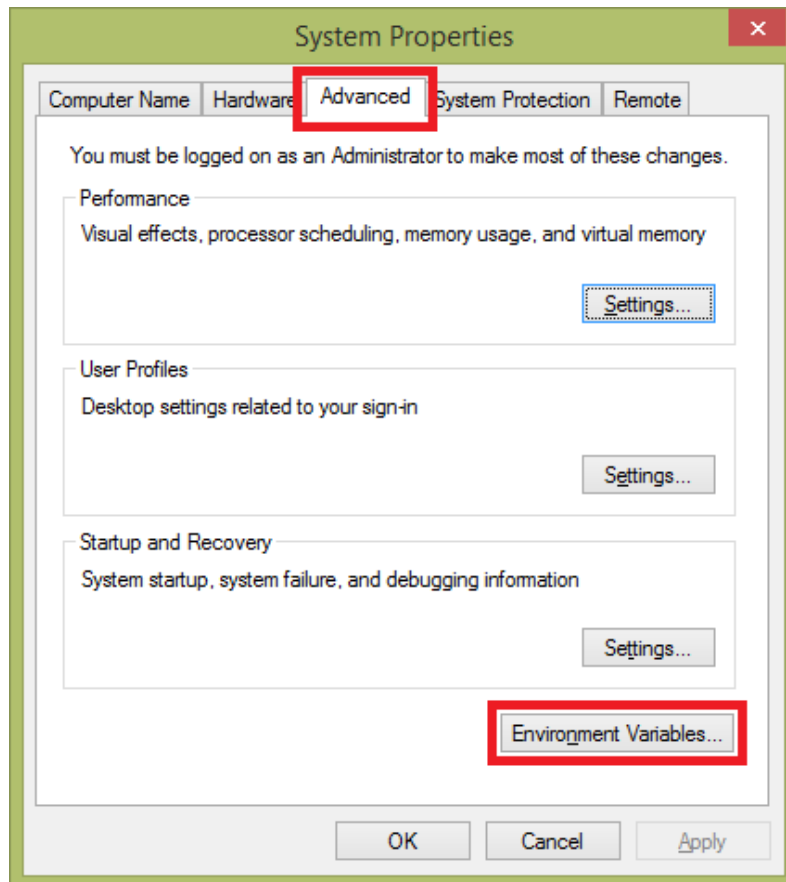


Python setup installation progress

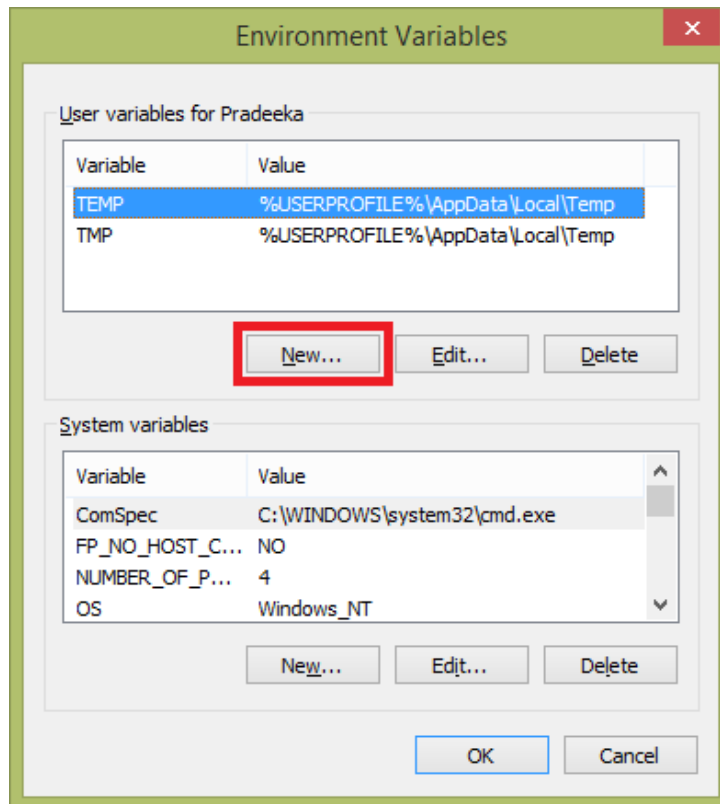


The Python setup is successful

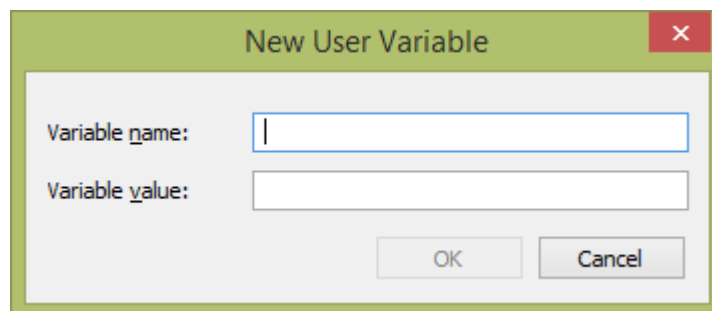
Setting environment variables for Python



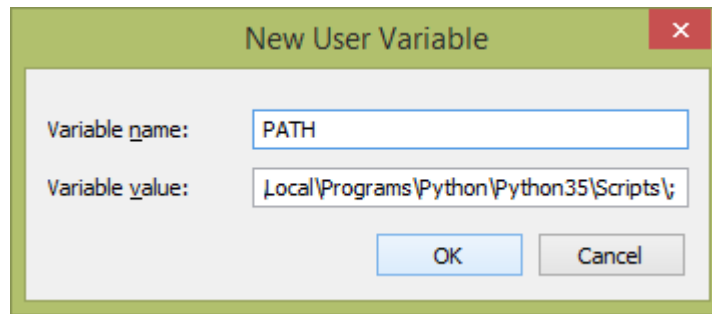
The System Properties dialog box



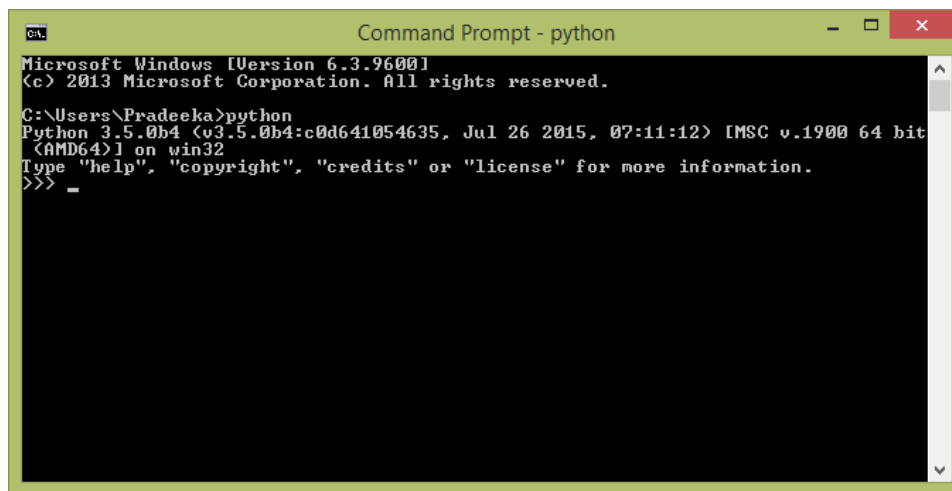
The Environment Variables dialog box



The New User Variable dialog box

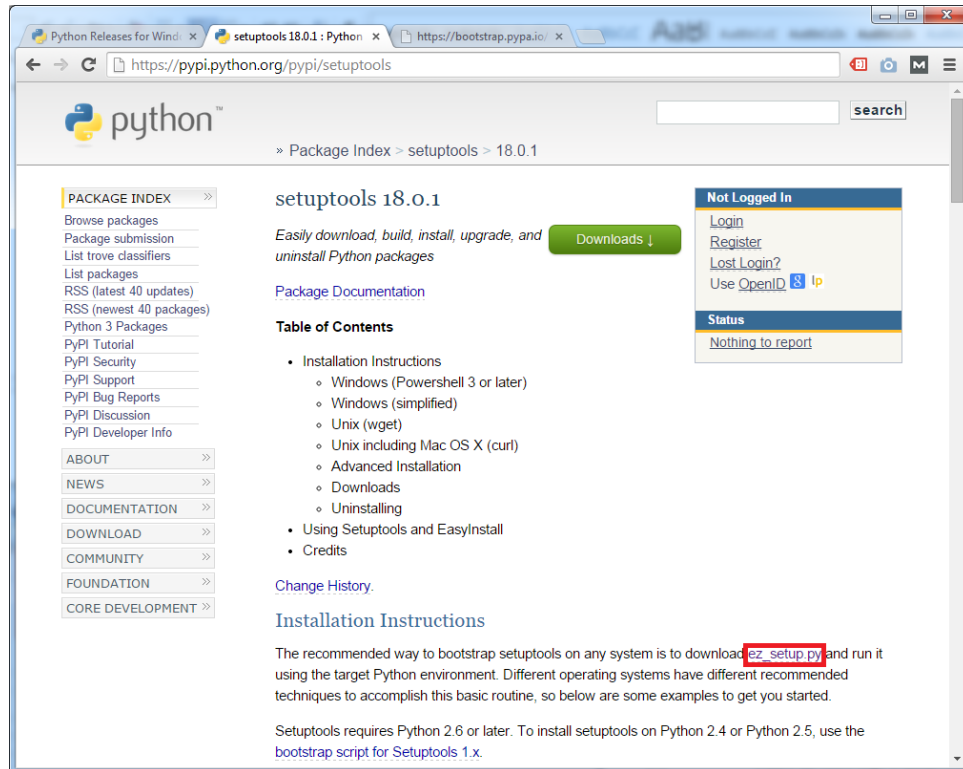


The New User Variable dialog box



Python Command Prompt

Installing the setuptools utility on Python



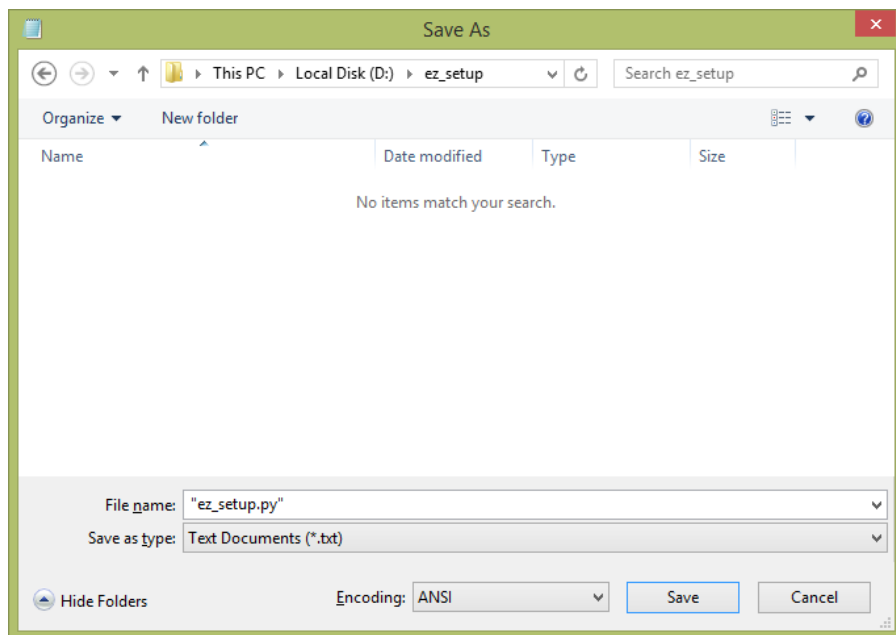
The Setuptools download page

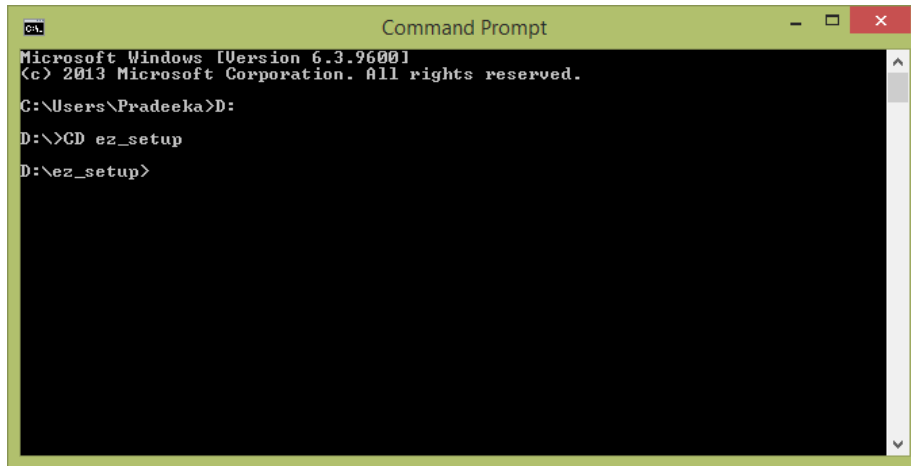
```
ez_setup - Notepad
File Edit Format View Help
# going in the directory
subdir = os.path.join(tmpdir, os.listdir(tmpdir)[0])
os.chdir(subdir)
log.warn('Now working in %s', subdir)
yield

finally:
    os.chdir(old_wd)
    shutil.rmtree(tmpdir)

def _do_download(version, download_base, to_dir, download_delay):
    """Download Setuptools."""
    egg = os.path.join(to_dir, 'setuptools-%s-py%d.%d.egg'
                       % (version, sys.version_info[0], sys.version_info[1]))
    if not os.path.exists(egg):
        archive = download_setuptools(version, download_base,
                                     to_dir, download_delay)
        _build_egg(egg, archive, to_dir)
    sys.path.insert(0, egg)

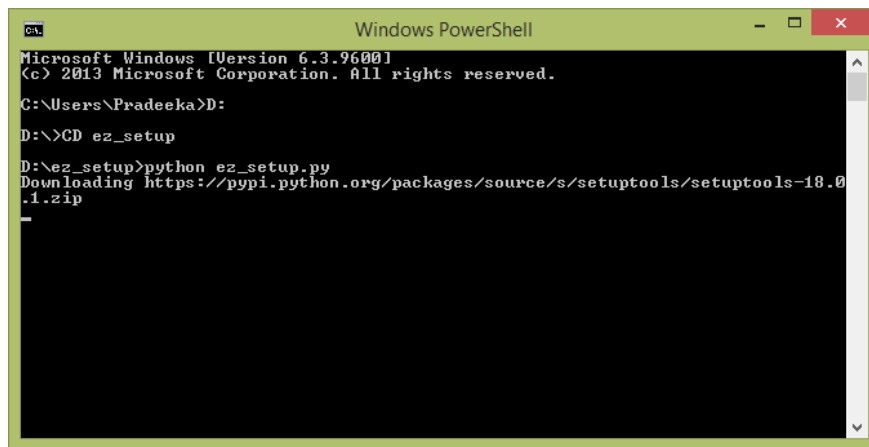
# Remove previously-imported pkg_resources if present (see
# https://bitbucket.org/pypa/setuptools/pull-request/7/ for details).
if 'pkg_resources' in sys.modules:
    del sys.modules['pkg_resources']
```





```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Users\Pradeeka>D:
D:\>CD ez_setup
D:\ez_setup>
```



```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

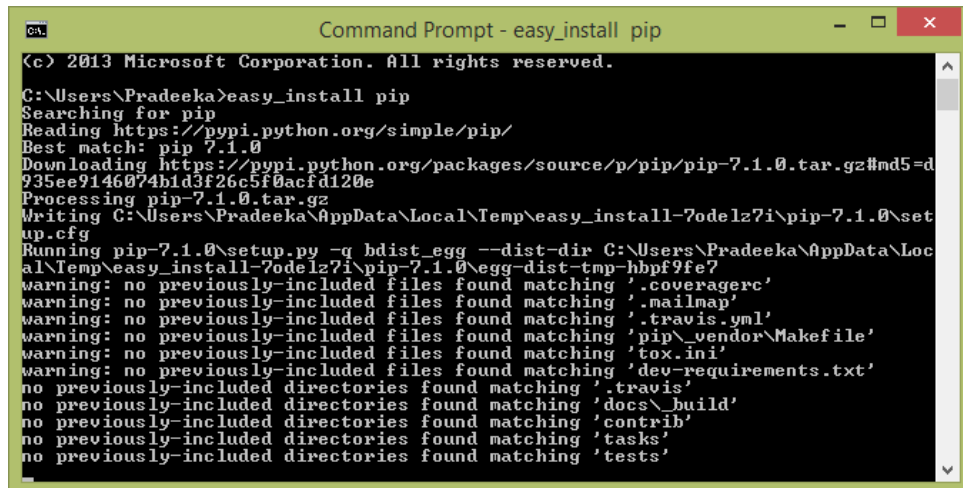
C:\Users\Pradeeka>D:
D:\>CD ez_setup
D:\ez_setup>python ez_setup.py
Downloading https://pypi.python.org/packages/source/s/setuptools/setuptools-18.0
.1.zip
```

```
ca. Command Prompt
copying setuptools.egg-info\top_level.txt -> build\bdist.win-amd64\egg\EGG-INFO
copying setuptools.egg-info\zip-safe -> build\bdist.win-amd64\egg\EGG-INFO
creating dist
creating 'dist\setuptools-18.0.1-py3.5.egg' and adding 'build\bdist.win-amd64\egg' to it
removing 'build\bdist.win-amd64\egg' (and everything under it)
Processing setuptools-18.0.1-py3.5.egg
Copying setuptools-18.0.1-py3.5.egg to c:\users\pradeeka\appdata\local\programs\python\python35\lib\site-packages
Adding setuptools 18.0.1 to easy-install.pth file
Installing easy_install-3.5-script.py script to C:\Users\Pradeeka\AppData\Local\Programs\Python\Python35\Scripts
Installing easy_install-3.5.exe script to C:\Users\Pradeeka\AppData\Local\Programs\Python\Python35\Scripts
Installing easy_install-script.py script to C:\Users\Pradeeka\AppData\Local\Programs\Python\Python35\Scripts
Installing easy_install.exe script to C:\Users\Pradeeka\AppData\Local\Programs\Python\Python35\Scripts

Installed c:\users\pradeeka\appdata\local\programs\python\python35\lib\site-packages\setuptools-18.0.1-py3.5.egg
Processing dependencies for setuptools==18.0.1
Finished processing dependencies for setuptools==18.0.1

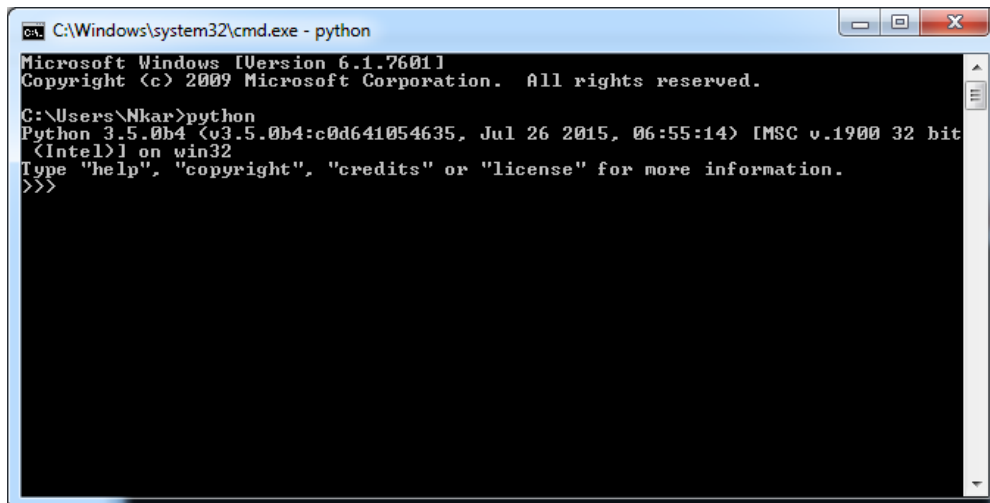
D:\ez_setup>
```

Installing the pip utility on Python



```
Command Prompt - easy_install pip
(c) 2013 Microsoft Corporation. All rights reserved.
C:\Users\Pradeeka>easy_install pip
Searching for pip
Reading https://pypi.python.org/simple/pip/
Best match: pip 7.1.0
Downloading https://pypi.python.org/packages/source/p/pip/pip-7.1.0.tar.gz#md5=935ee9146074b1d3f26c5f0acfd120e
Processing pip-7.1.0.tar.gz
Writing C:\Users\Pradeeka\AppData\Local\Temp\easy_install-70delz7i\pip-7.1.0\setup.cfg
Running pip-7.1.0\setup.py -q bdist_egg --dist-dir C:\Users\Pradeeka\AppData\Local\Temp\easy_install-70delz7i\pip-7.1.0\egg-dist-tmp-hbpf9fe7
warning: no previously-included files found matching '.coveragerc'
warning: no previously-included files found matching '.mailmap'
warning: no previously-included files found matching '.travis.yml'
warning: no previously-included files found matching 'pip\_vendor\Makefile'
warning: no previously-included files found matching 'tox.ini'
warning: no previously-included files found matching 'dev-requirements.txt'
no previously-included directories found matching '.travis'
no previously-included directories found matching 'docs\_build'
no previously-included directories found matching 'contrib'
no previously-included directories found matching 'tasks'
no previously-included directories found matching 'tests'
```

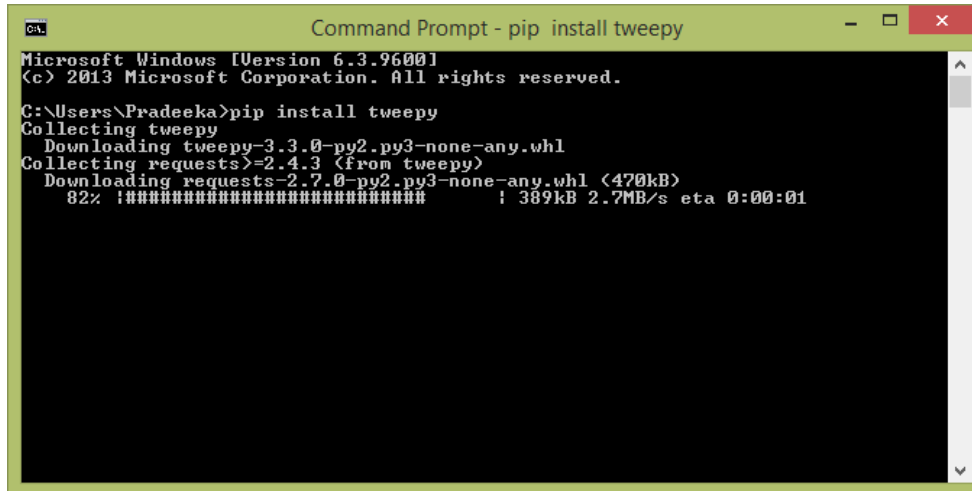
Opening the Python interpreter



```
C:\Windows\system32\cmd.exe - python
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Nkar>python
Python 3.5.0b4 (v3.5.0b4:c0d641054635, Jul 26 2015, 06:55:14) [MSC v.1900 32 bit
<Intel>] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

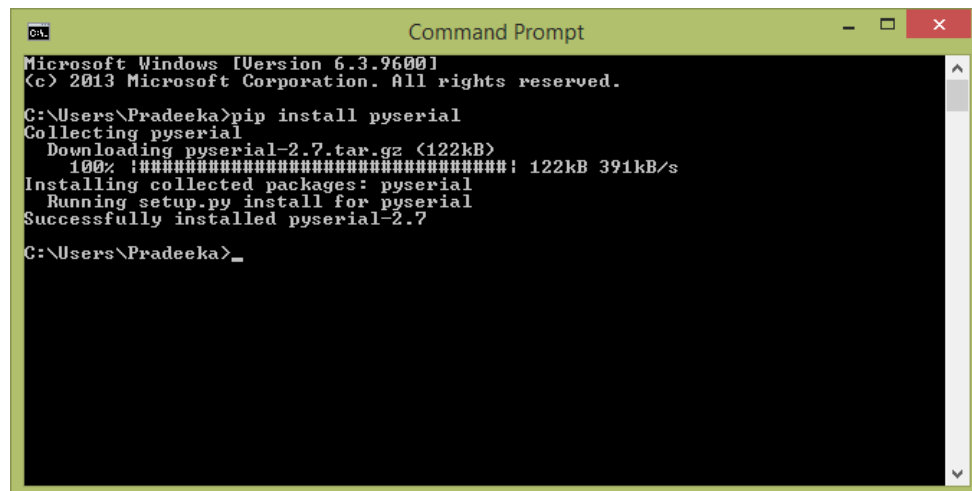
Installing the Tweepy library



```
Command Prompt - pip install tweepy
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Users\Pradeeka>pip install tweepy
Collecting tweepy
  Downloading tweepy-3.3.0-py2.py3-none-any.whl
Collecting requests>=2.4.3 (from tweepy)
  Downloading requests-2.7.0-py2.py3-none-any.whl (470kB)
    82% |#####| 389kB 2.7MB/s eta 0:00:01
```

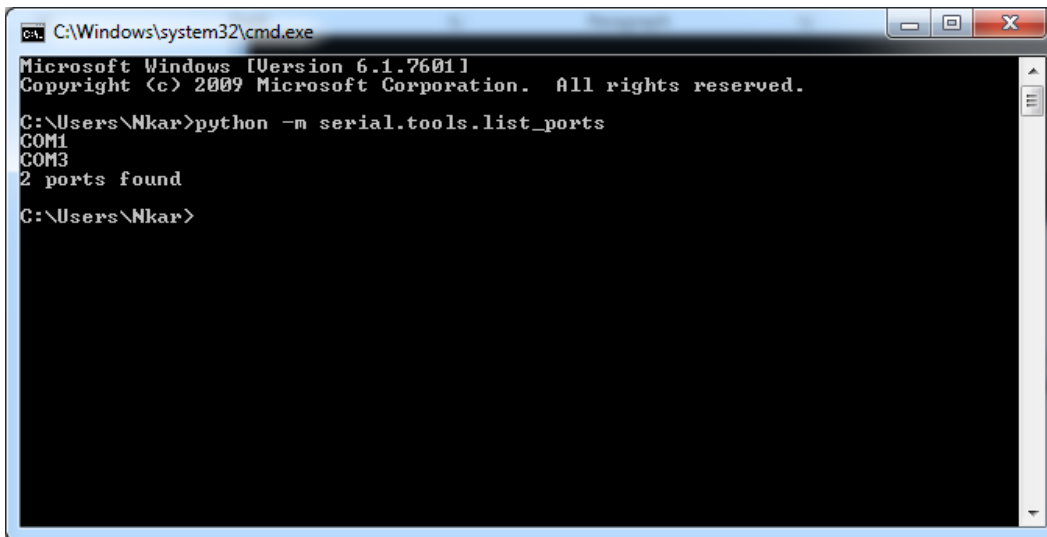
Installing pySerial



```
Command Prompt
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Users\Pradeeka>pip install pyserial
Collecting pyserial
  Downloading pyserial-2.7.tar.gz (122kB)
    100% |#####| 122kB 391kB/s
Installing collected packages: pyserial
  Running setup.py install for pyserial
Successfully installed pyserial-2.7

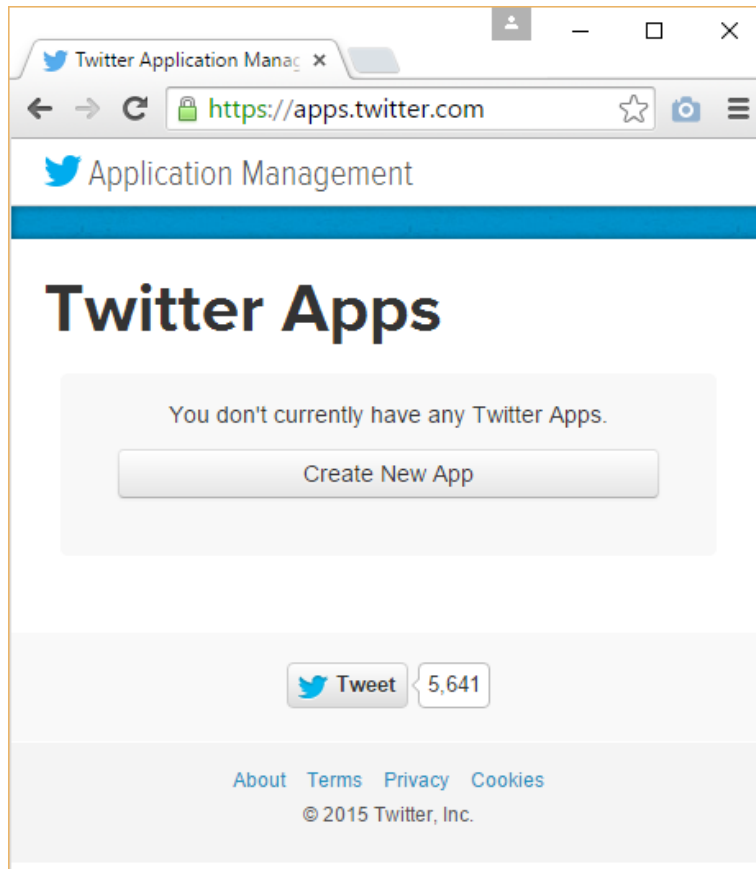
C:\Users\Pradeeka>_
```



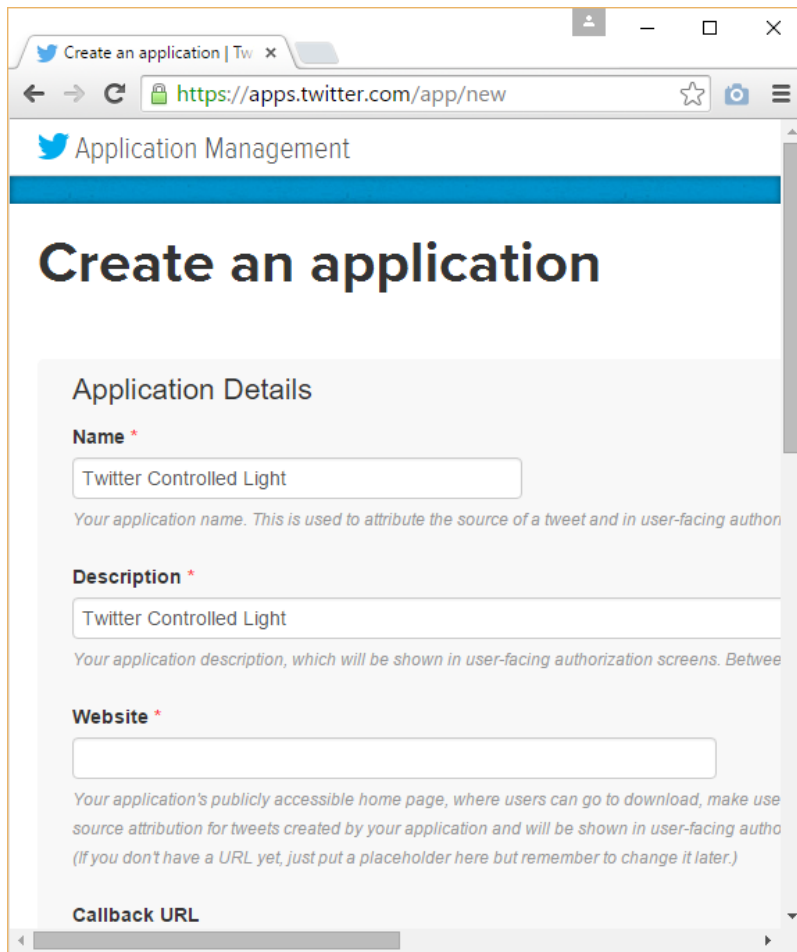
```
cmd: C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Nkar>python -m serial.tools.list_ports
COM1
COM3
2 ports found
C:\Users\Nkar>
```

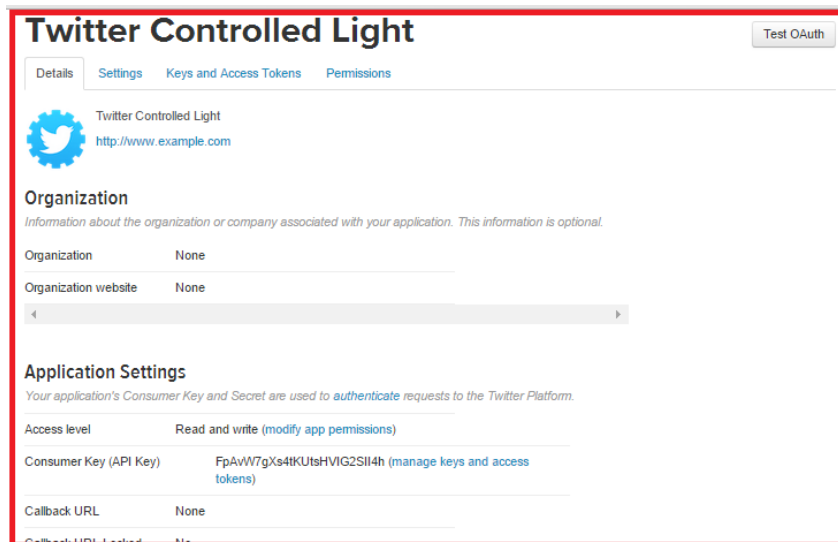
Creating a Twitter app and obtaining API keys



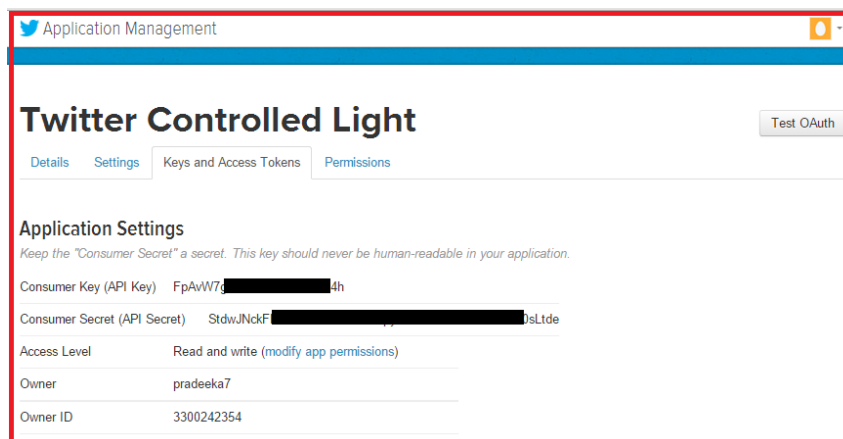
apps.twitter.com, the Application Management start page



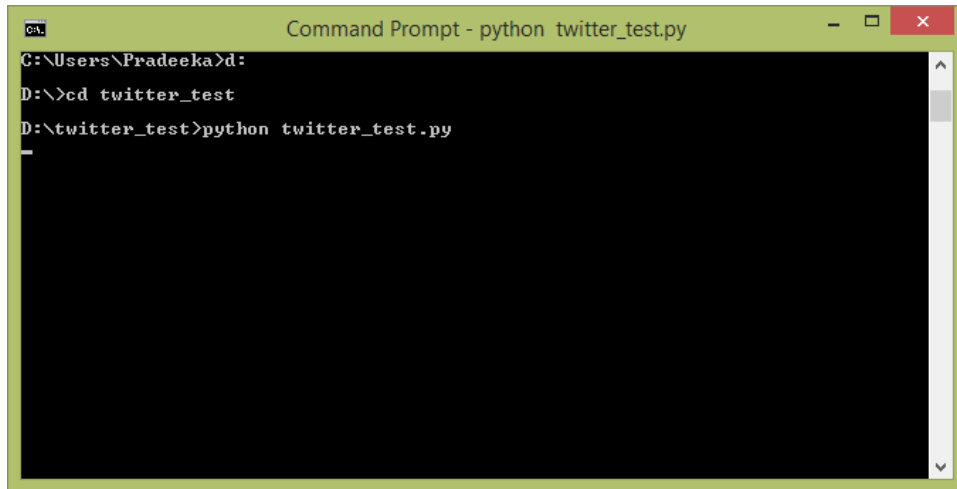
Twitter's Create an application page



The Twitter Application settings page



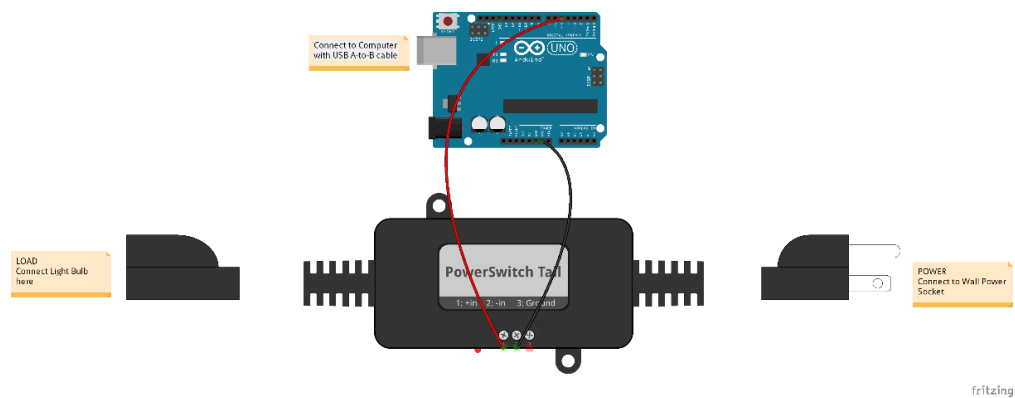
Writing a Python script to read Twitter tweets



```
Command Prompt - python twitter_test.py
C:\Users\Pradeeka>d:
D:\>cd twitter_test
D:\twitter_test>python twitter_test.py
```

Reading the serial data using Arduino

Connecting PowerSwitch Tail with Arduino



Chapter 8: Controlling Infrared Devices using IR Remote

Building an Arduino infrared recorder and remote

Software

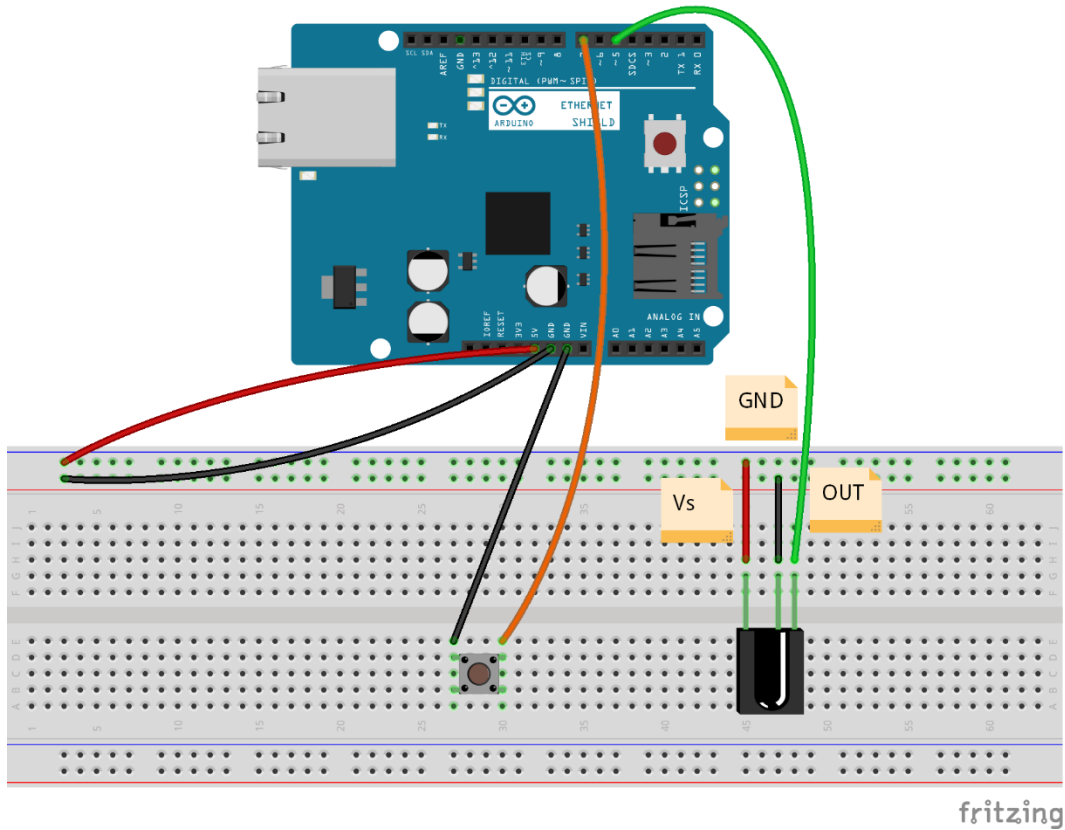
The screenshot shows the GitHub repository page for `z3t0 / Arduino-IRremote`. The repository description is "Infrared remote library for Arduino: send and receive infrared signals with multiple protocols" with a link to <http://arfcn.com/2009/08/multi-protocol-infrared-remote-library.html>. The repository has 202 commits, 3 branches, 3 releases, and 29 contributors. The file list includes:

File	Description	Time
examples	Merge pull request #213 from AnalysIR/master	a month ago
.gitignore	Add Teensy LC Support, confirmed working @48Mhz with RecvDemo	3 months ago
.travis.yml	Merge branch 'ivankravets-master' into experimental	2 months ago
Contributors.md	Update Contributors.md	2 months ago
IRremote.cpp	Update version to 2.0.1	4 days ago
IRremote.h	Update version to 2.0.1	4 days ago
IRremoteInt.h	Update version to 2.0.1	4 days ago
LICENSE.txt	Initial commit from Iremote.zip	6 years ago
README.md	Contact info @readme.md	4 hours ago
changelog.md	Updated changelog	2 months ago

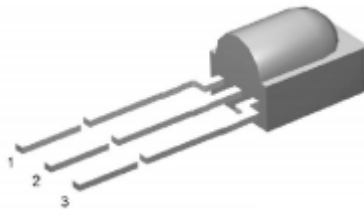
On the right side, the "Code" section shows options for Issues (52), Pull requests (10), Wiki, Pulse, and Graphs. The "HTTPS clone URL" is `https://github.com/:`. Below this, there are buttons for "Clone in Desktop" and "Download ZIP", with the latter being highlighted by a red box.

Arduino-IRremote library on GitHub

Building the IR receiver module

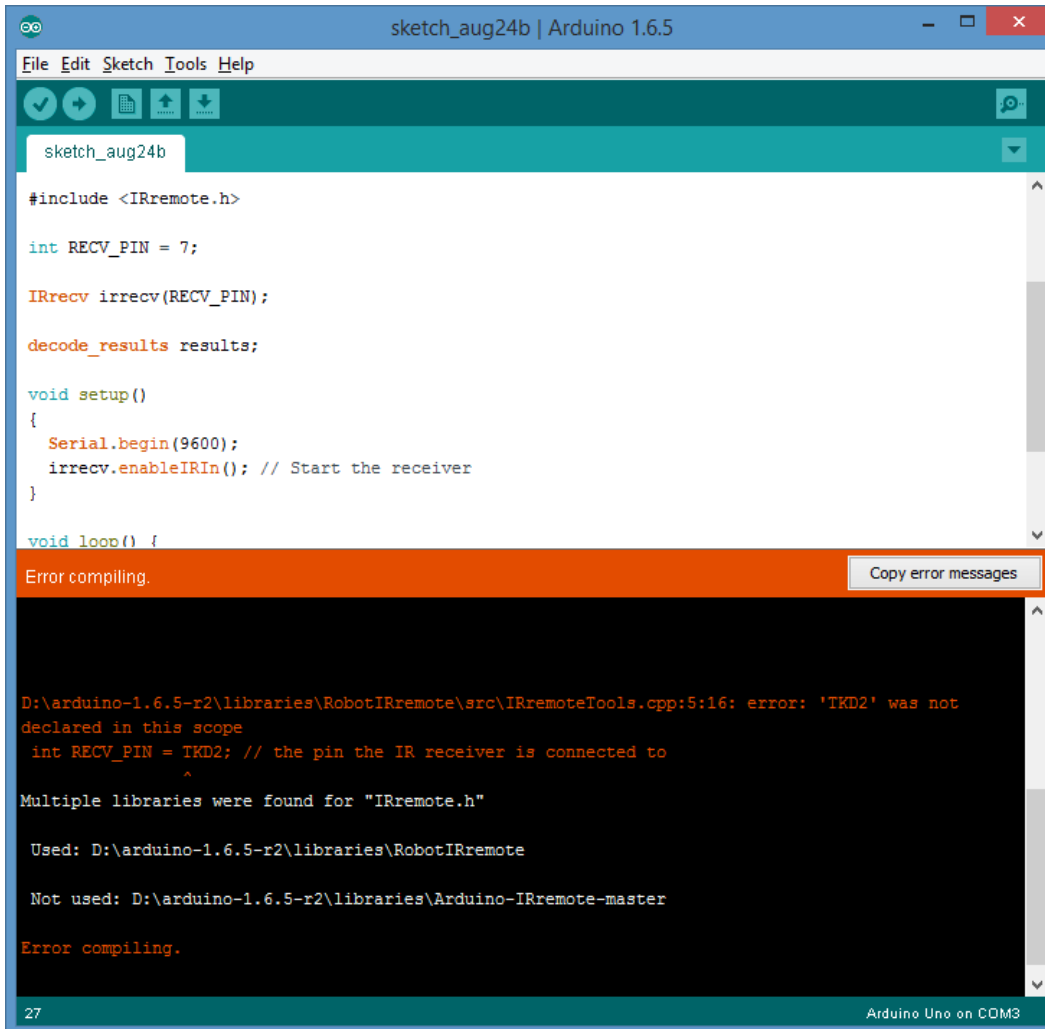


The IR Receiver: The TSOP382 IR receiver is attached to the Arduino+ Ethernet Shield - Fritzing representation



TSOP382 IR receiver diode from Vishay (<http://www.vishay.com/>)

Capturing IR commands in hexadecimal



The screenshot shows the Arduino IDE interface for a sketch named 'sketch_aug24b'. The code in the editor is as follows:

```
#include <IRremote.h>

int RECV_PIN = 7;

IRrecv irrecv(RECV_PIN);

decode_results results;

void setup()
{
  Serial.begin(9600);
  irrecv.enableIRIn(); // Start the receiver
}

void loop() {
```

Below the code, an orange error banner reads "Error compiling." with a "Copy error messages" button. The error message in the console is:

```
D:\arduino-1.6.5-r2\libraries\RobotIRremote\src\IRremoteTools.cpp:5:16: error: 'TKD2' was not
declared in this scope
  int RECV_PIN = TKD2; // the pin the IR receiver is connected to
                  ^
Multiple libraries were found for "IRremote.h"

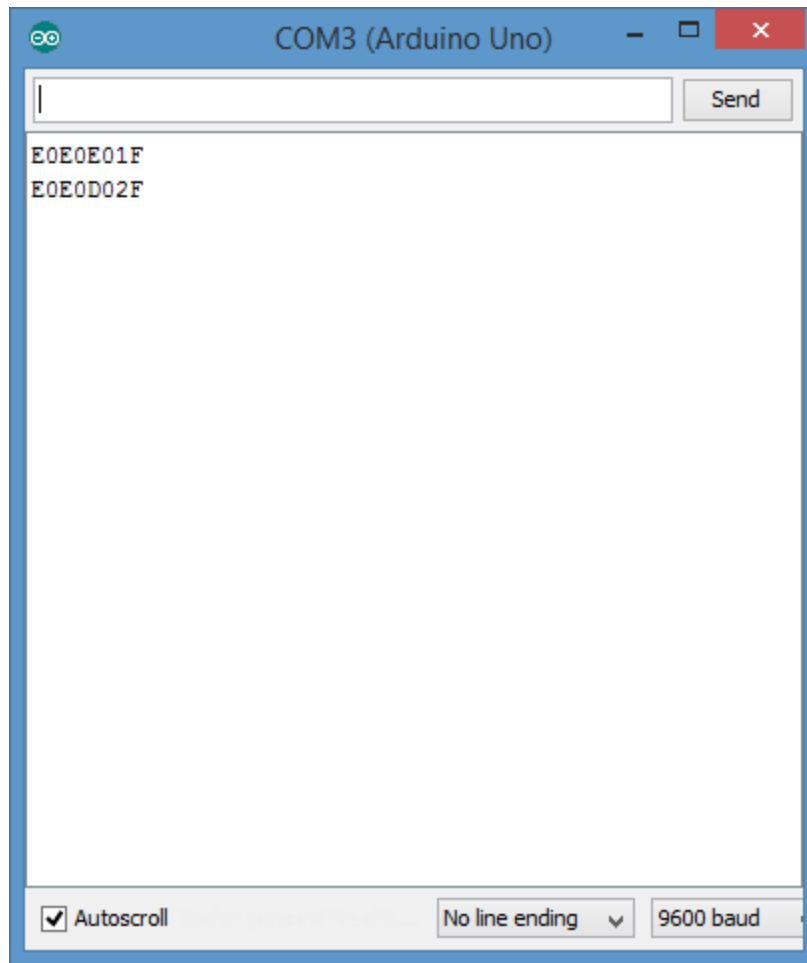
Used: D:\arduino-1.6.5-r2\libraries\RobotIRremote

Not used: D:\arduino-1.6.5-r2\libraries\Arduino-IRremote-master

Error compiling.
```

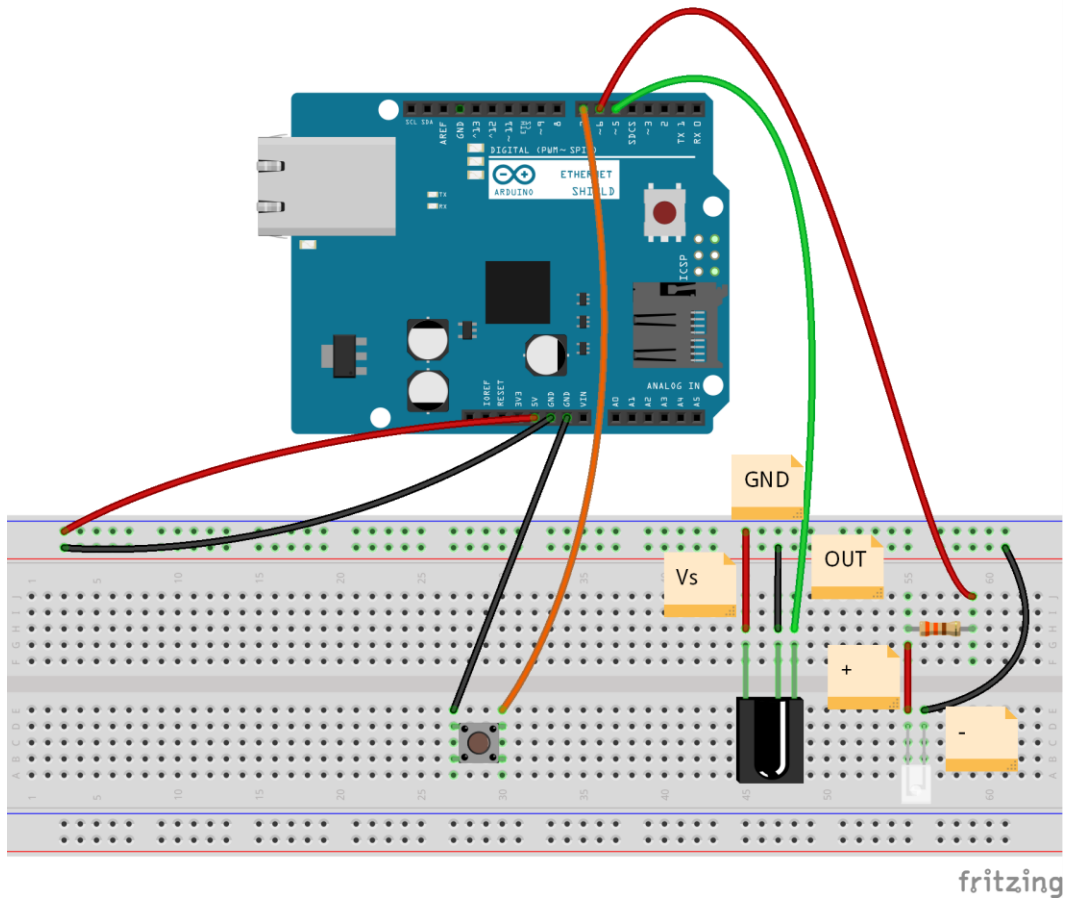
The status bar at the bottom indicates "27" and "Arduino Uno on COM3".

Compiler error because of the conflicting libraries



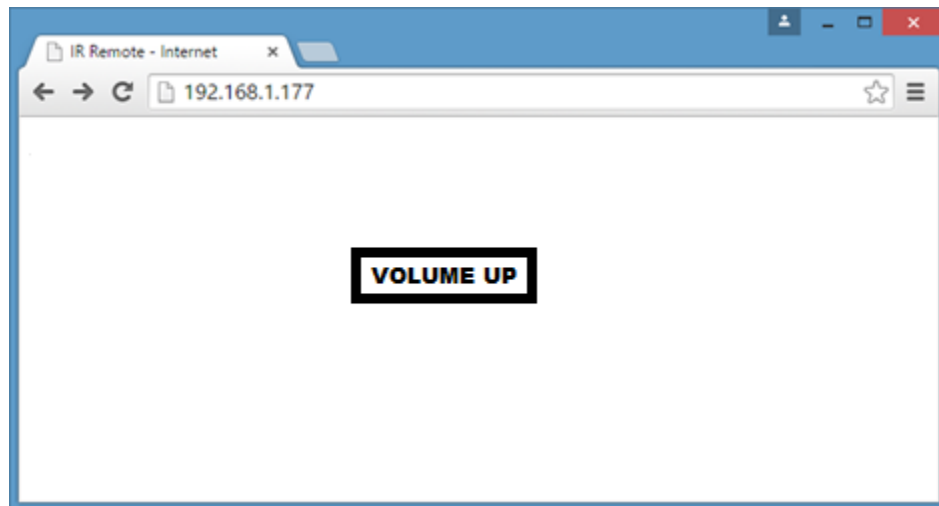
Hexadecimal values for SAMSUNG UA24H4100 TV volume up and volume down remote control buttons

Building the IR sender module



The IR sender: the infrared LED is attached to the Arduino Ethernet Shield—Fritzing Representation

Controlling through the LAN



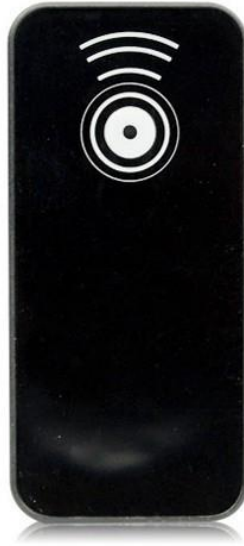
Adding an IR socket to non-IR enabled devices



Infrared Socket—Front View (image taken from eBay)



IR socket side view (image taken from eBay)



The IR remote control for The IR socket (image taken from eBay)

