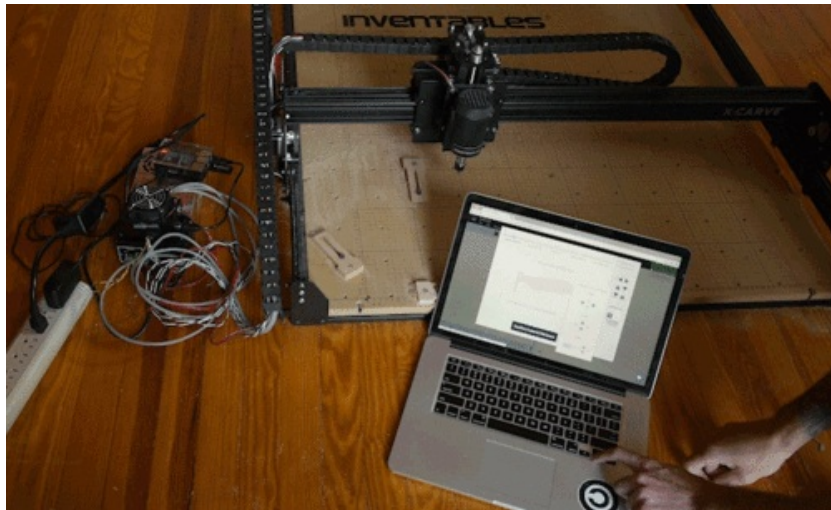




Run an X-Carve CNC Machine Wirelessly with a Raspberry Pi

Created by Todd Treece

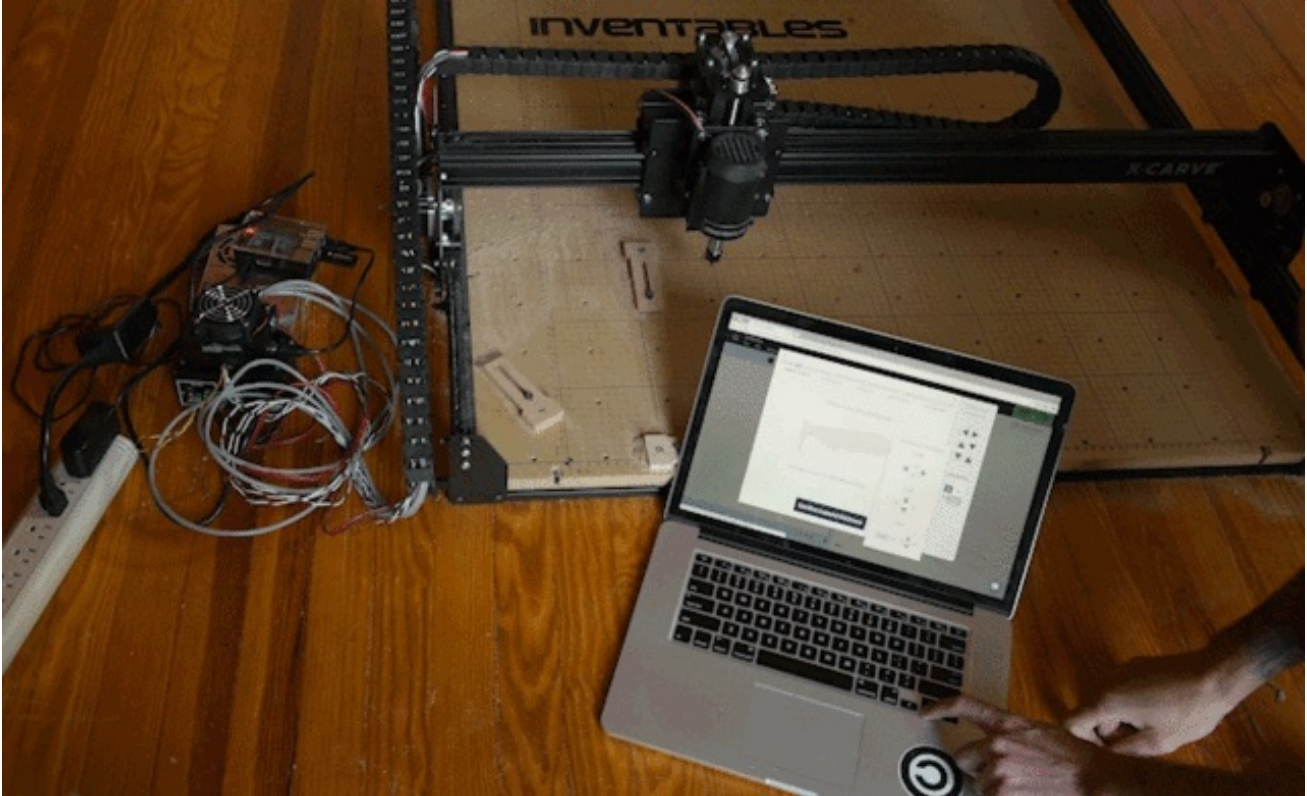


Last updated on 2015-08-18 01:20:14 PM EDT

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Setting Up the Proxy



I recently picked up an [X-Carve CNC router](http://adafru.it/fQg) (<http://adafru.it/fQg>). Its a great tool, but Inventables' web based digital CNC software, [Easel](http://adafru.it/fQf) (<http://adafru.it/fQf>), currently requires a constant connection from a Mac or Windows based computer in order to send commands to the [X-Carve](http://adafru.it/fQg) (<http://adafru.it/fQg>) over USB. This tutorial will show you how you can free up your main computer while the X-Carve is running by using a Raspberry Pi as a bridge to wirelessly send commands to the X-Carve's Arduino Uno. We will also use a Powerswitch Tail to automatically control the main power to the X-Carve when Easel launches in your web browser.

Setup your X-Carve with the standard install instructions before continuing with this guide.

Hardware Requirements

If you aren't using our [Raspberry Pi 2 starter pack](http://adafru.it/fQh) (<http://adafru.it/fQh>), you will need the following pieces of hardware to complete this project:

- [Raspberry Pi 2](http://adafru.it/eCB) (<http://adafru.it/eCB>)
- [microSD card](http://adafru.it/1121) (<http://adafru.it/1121>) formatted with the latest version of [Raspbian](http://adafru.it/fQi) (<http://adafru.it/fQi>).
- [WiFi dongle](http://adafru.it/1012) (<http://adafru.it/1012>)
- [Power Supply](http://adafru.it/1995) (<http://adafru.it/1995>)

- [Raspberry Pi 2 case \(http://adafru.it/dV5\)](http://adafru.it/dV5)

In addition to the hardware included in the starter pack, you will also need the following items:

- [Ethernet Cable \(http://adafru.it/730\)](http://adafru.it/730) (for the setup process)
- 2x [Female to Male \(http://adafru.it/1952\)](http://adafru.it/1952) jumper wires (12 inches or longer)
- [Powerswitch Tail \(http://adafru.it/268\)](http://adafru.it/268) (for automatic control of the X-Carve's power supply)
- [USB Type A to B Cable \(http://adafru.it/fQj\)](http://adafru.it/fQj)

Raspberry Pi Setup

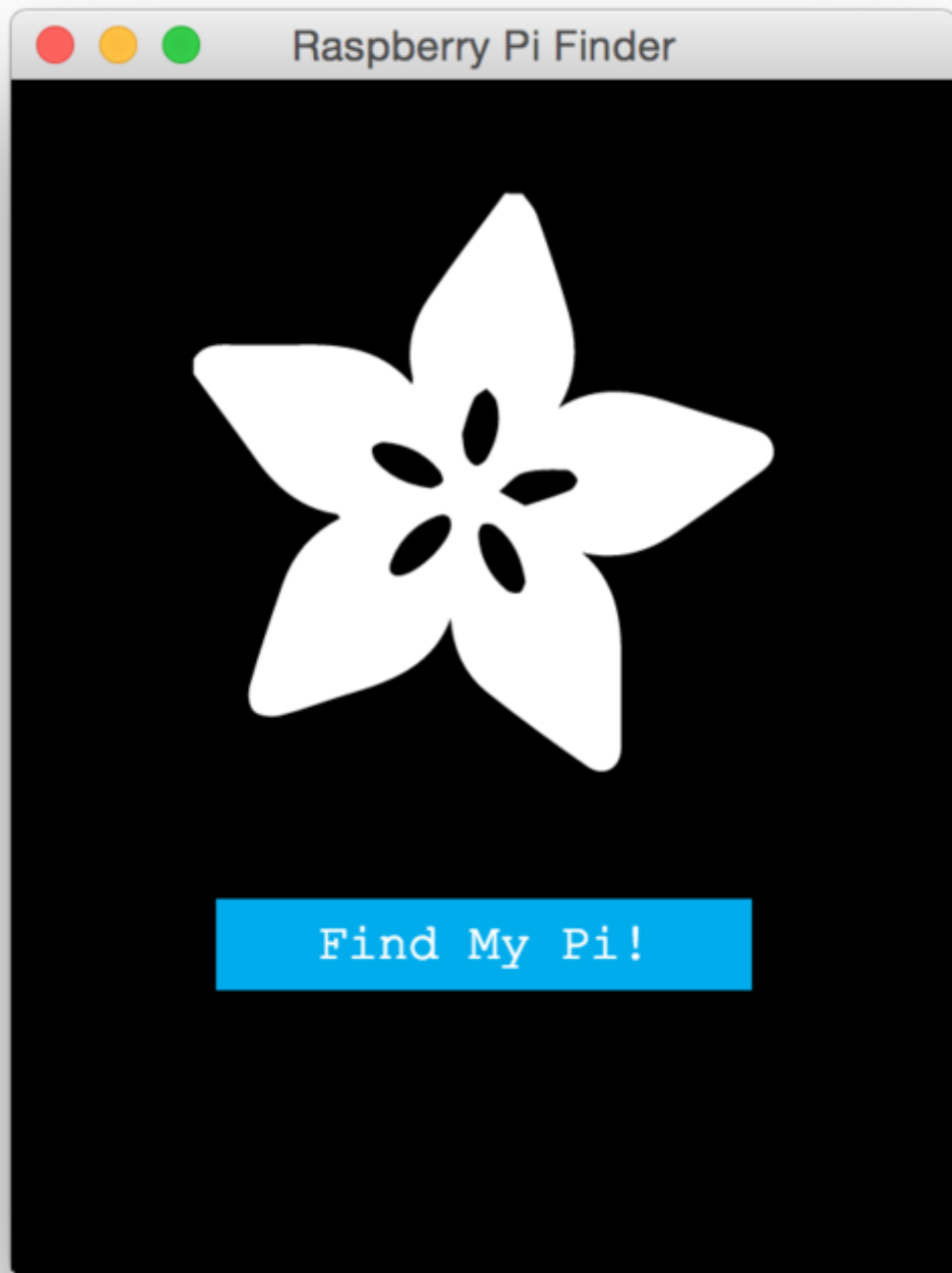
Install your Raspberry Pi into the case, and insert the microSD card into the Pi's microSD card slot. If you have not formatted your microSD card with Raspbian, please [follow our guide \(http://adafru.it/evL\)](http://adafru.it/evL) on the formatting process. If you have the Raspberry Pi starter pack, your SD card should come with Raspbian pre-installed.

Once you have the SD card setup, attach the WiFi dongle, power supply, and ethernet cable to the appropriate ports on the Pi. You will need to move your Pi close to your network router during the setup process, but you will be able to move it anywhere within WiFi range once the setup process is complete. Plug in the other end of the ethernet cable into a free port on your wireless router, and power on the Raspberry Pi by plugging in the power supply to a wall outlet.

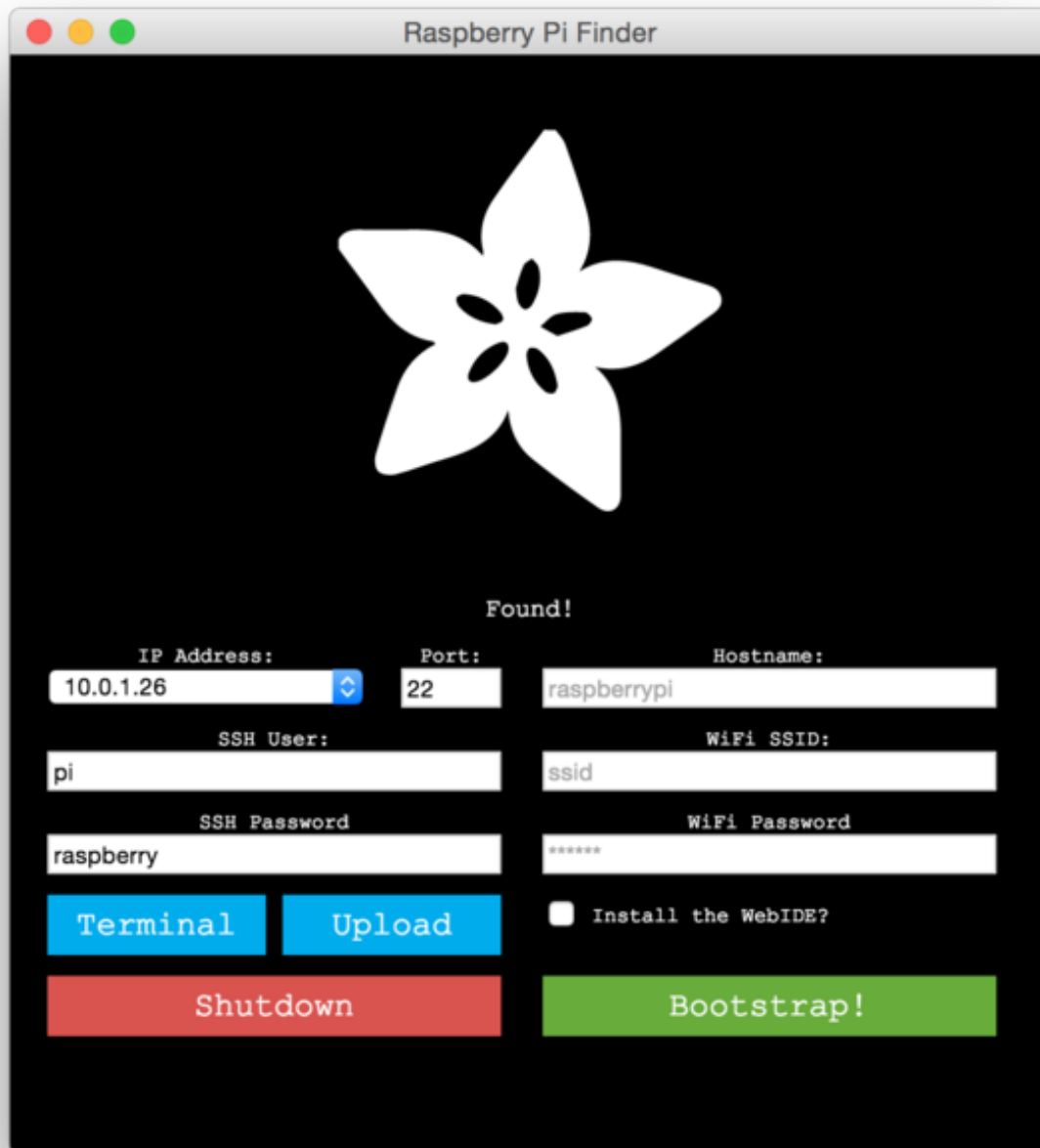


Next, download a copy of the [Adafruit Raspberry Pi Finder \(http://adafru.it/f23\)](http://adafru.it/f23) on your Windows, Mac, or Linux computer, install it, and launch the application. Follow the [Pi Finder's guide \(http://adafru.it/f23\)](http://adafru.it/f23) if you need more info about the installation process.

After the Pi Finder launches, click the **Find My Pi!** button to search for your Pi.



Once the Raspberry Pi has been located, you will see a screen like the one shown below.



Raspberry Pi Finder

Found!

IP Address: 10.0.1.26 Port: 22 Hostname: raspberrypi

SSH User: pi WiFi SSID: ssid

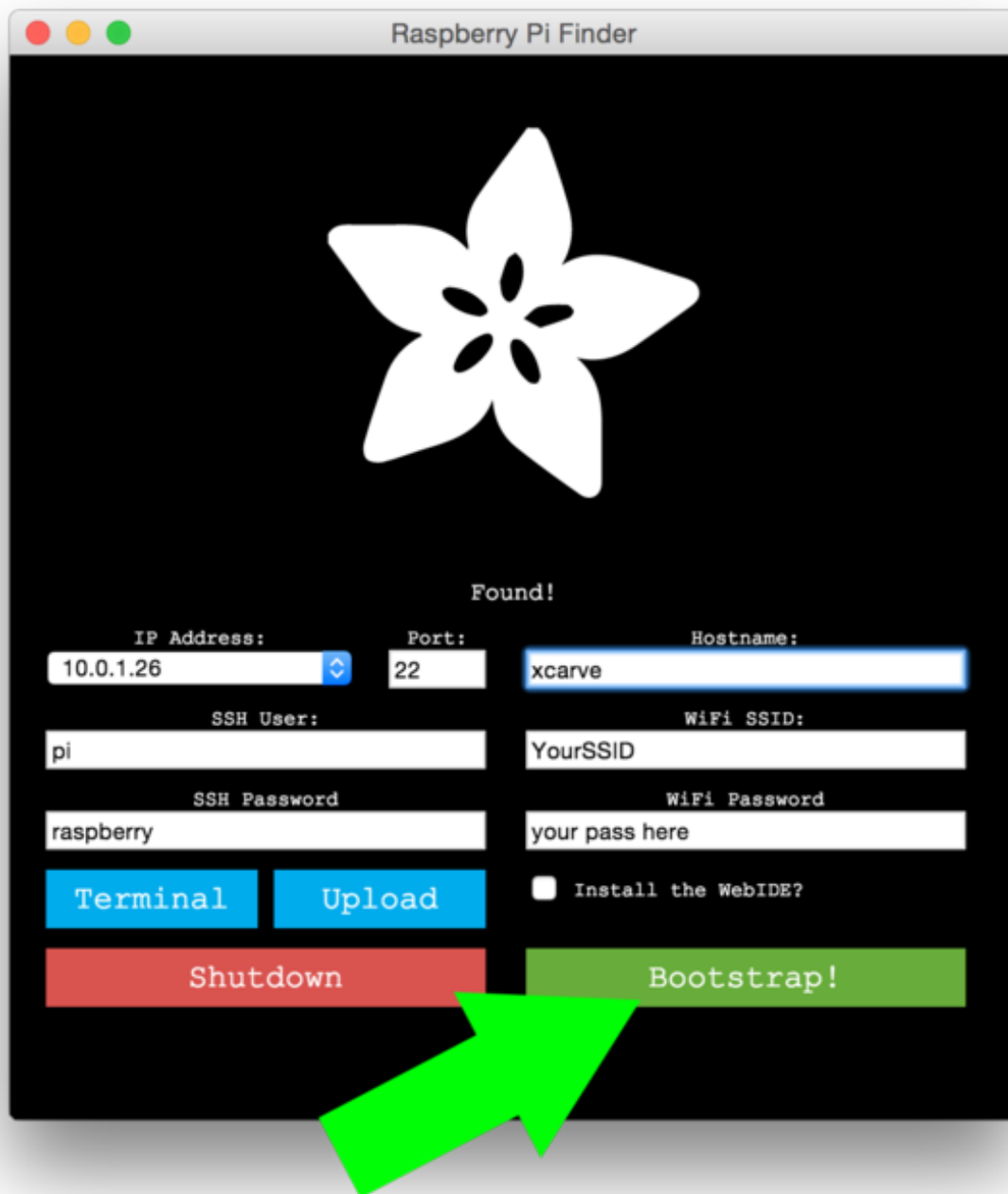
SSH Password: rasperry WiFi Password: *****

Terminal Upload

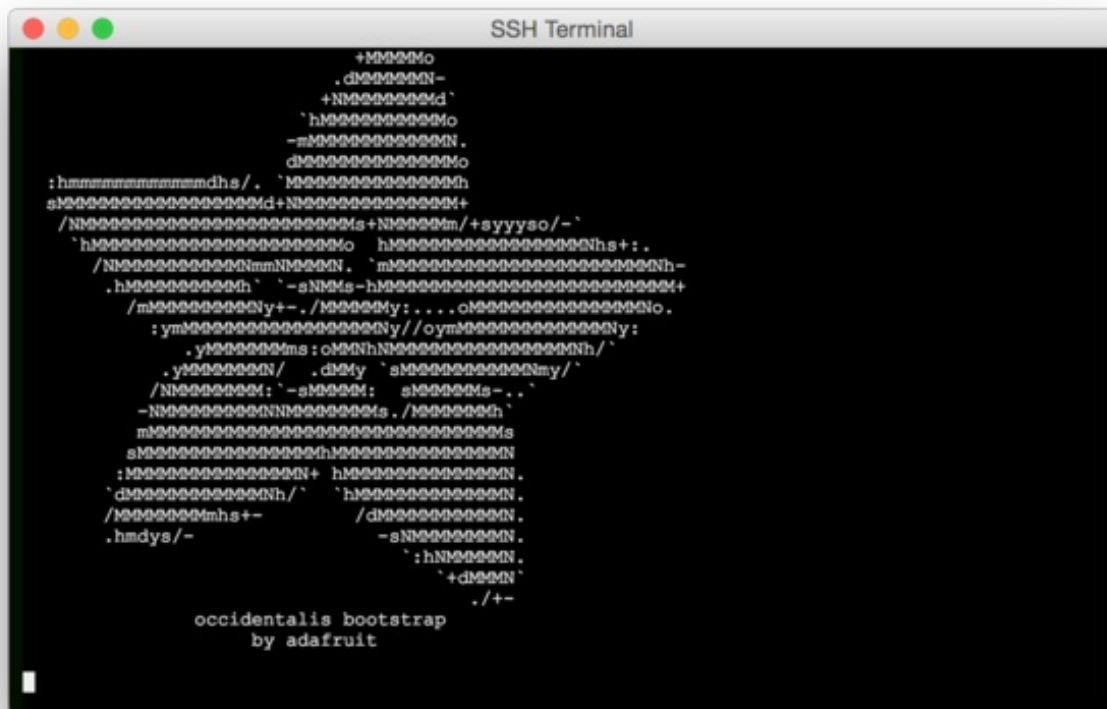
Shutdown Bootstrap!

☐ Install the WebIDE?

Enter *xcarve* into the **hostname** field, and fill in the appropriate **WiFi SSID** and **WiFi Password** for your network. Then click the green **Bootstrap!** button to set up your Pi.



You will then see a window appear that will show you the progress of the bootstrapping process. It will take a few minutes to complete, and may take several minutes depending on the speed of your internet connection.



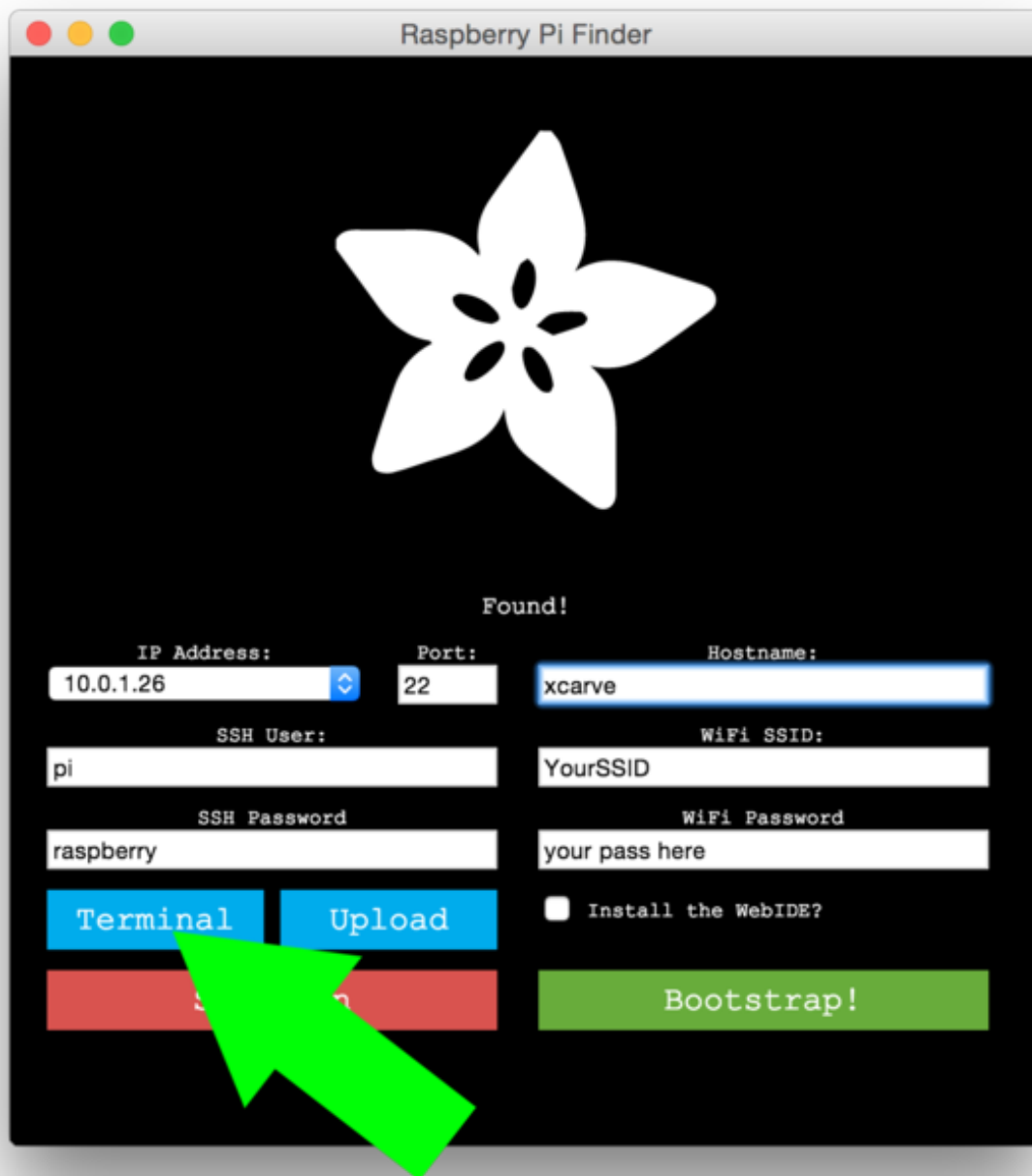
```

+MMMMMo
.dMMMMMN-
+NNMMMMMMd`
`hMMMMMMMMMo
-mMMMMMMMMMN.
dMMMMMMMMMMo
: hMMMMMMMMMMMMdhs /. `MMMMMMMMMMMMMh
sMMMMMMMMMMMMMMMMd+NNMMMMMMMMMMMMM+
/NNMMMMMMMMMMMMMMMMMMMMs+NNMMMM/+syyyso/-`
`hMMMMMMMMMMMMMMMMMMMMMo hMMMMMMMMMMMMMMMMMMNhs+:.
/NNMMMMMMMMMMNmmNNMMMMN. `mMMMMMMMMMMMMMMMMMMN-
.hMMMMMMMMMMh`~-sNNMs-hMMMMMMMMMMMMMMMMMMMMMM+
/mMMMMMMMMMMNy+-. /MMMMMMY:....oMMMMMMMMMMMMMMNo.
:ymMMMMMMMMMMMMMMMMMMNy//oymMMMMMMMMMMMMMMNy:
.yMMMMMMMMMs:oMMNhNNMMMMMMMMMMMMMMNh/`
.yMMMMMMN/ .dMMY `sMMMMMMMMMMNy/`
/NNMMMMMM:~-sMMMMM: sMMMMMs-..`
-NNMMMMMMMMNNMMMMMMMMMs./MMMMMMh`
mMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMs
sMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMN
:MMMMMMMMMMMMMMMMMM+ hMMMMMMMMMMMMMMMMMMN.
`dMMMMMMMMMMMMMMh/` `hMMMMMMMMMMMMMMN.
/MMMMMMMMMMhs+- /dMMMMMMMMMMN.
.hmdys/- -sNNMMMMMMN.
`;hNNMMMMMMN.
`+dMMMMN`
./+-

occidentalis bootstrap
by adafruit

```

You will then be returned to the Pi Finder window once the bootstrapping process has completed. Click on the blue **Terminal** button to open a SSH session to the Raspberry Pi. If you need help getting started with the command line, check out our great [command line introduction guide](http://adafruit.com/command-line-introduction) (<http://adafruit.com/command-line-introduction>).

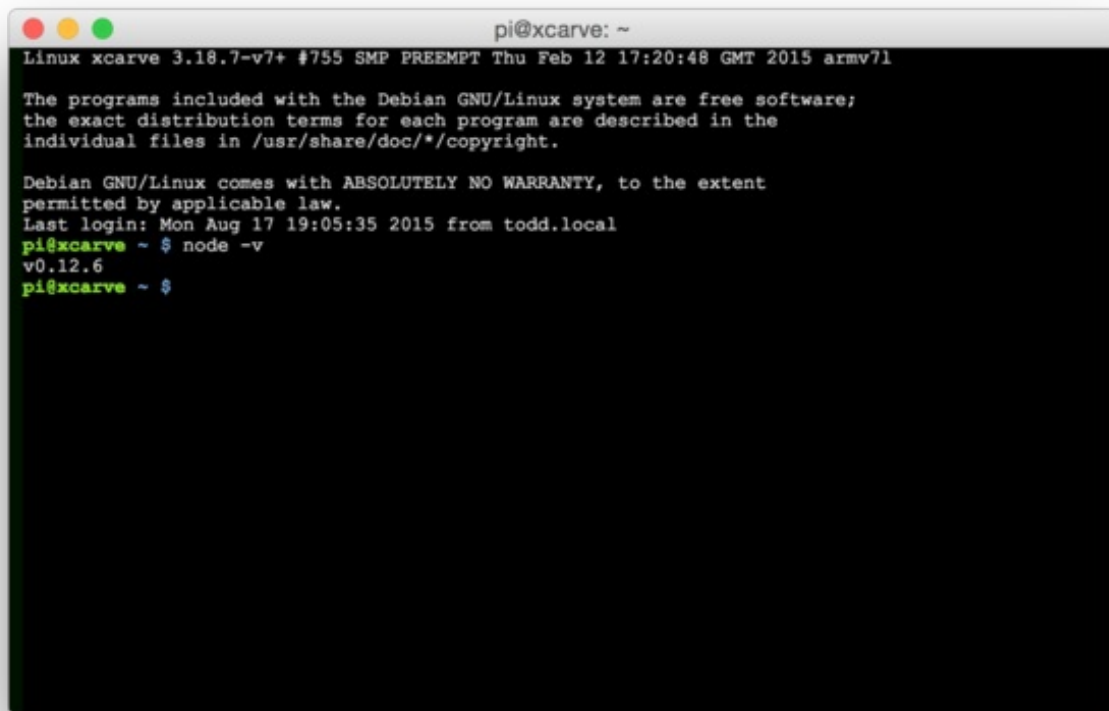


Installing the X-Carve Service on the Raspberry Pi

First, check to make sure Node.js was properly installed by the bootstrap process by typing the following command at the prompt.

```
node -v
```

You should have v0.12.6 or higher installed.

A terminal window titled 'pi@xcarve: ~' showing the following text:

```
Linux xcarve 3.18.7-v7+ #755 SMP PREEMPT Thu Feb 12 17:20:48 GMT 2015 armv7l

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Mon Aug 17 19:05:35 2015 from todd.local
pi@xcarve ~ $ node -v
v0.12.6
pi@xcarve ~ $
```

Make sure that npm has the proper permissions to install packages by running the following command.

```
sudo chown -R pi /usr/local
```

Next, install the **xcarve-server**, **forever**, and **forever-service** packages using *npm*.

```
npm install -g forever forever-service xcarve-server
```

It will take a few minutes to build and install the server software.

```
pi@xcarve: ~  
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent  
permitted by applicable law.  
Last login: Mon Aug 17 19:13:43 2015 from todd.local  
pi@xcarve ~ $ node -v  
v0.12.6  
pi@xcarve ~ $ sudo chown -R pi /usr/local  
pi@xcarve ~ $ npm install -g forever-service xcarve-server  
  
> bufferutil@1.1.0 install /usr/local/lib/node_modules/xcarve-server/node_modules/socket.io/node_modules/engine.io/node_modules/ws/node_modules/bufferutil  
> node-gyp rebuild  
  
make: Entering directory '/usr/local/lib/node_modules/xcarve-server/node_modules/socket.io/node_modules/engine.io/node_modules/ws/node_modules/bufferutil/build'  
CXX(target) Release/obj.target/bufferutil/src/bufferutil.o  
SOLINK_MODULE(target) Release/obj.target/bufferutil.node  
COPY Release/bufferutil.node  
make: Leaving directory '/usr/local/lib/node_modules/xcarve-server/node_modules/socket.io/node_modules/engine.io/node_modules/ws/node_modules/bufferutil/build'  
  
> utf-8-validate@1.1.0 install /usr/local/lib/node_modules/xcarve-server/node_modules/socket.io/node_modules/engine.io/node_modules/ws/node_modules/utf-8-validate  
> node-gyp rebuild  
  
make: Entering directory '/usr/local/lib/node_modules/xcarve-server/node_modules/socket.io/node_modules/engine.io/node_modules/ws/node_modules/utf-8-validate/build'  
CXX(target) Release/obj.target/validation/src/validation.o
```

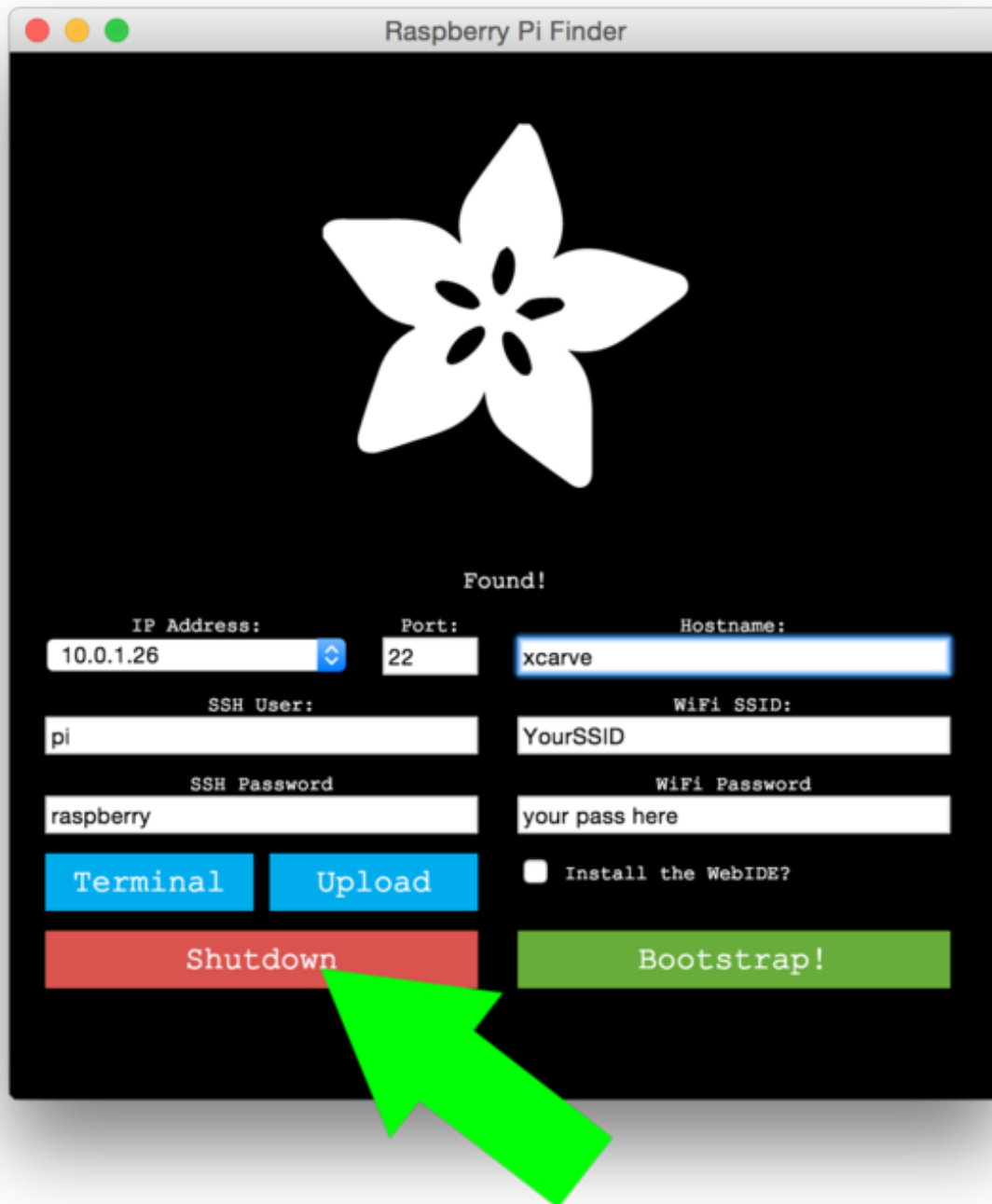
Once the packages have been installed, start the X-Carve service by running the following command.

```
xcarve-server start
```

You should then see the service start in the SSH window.

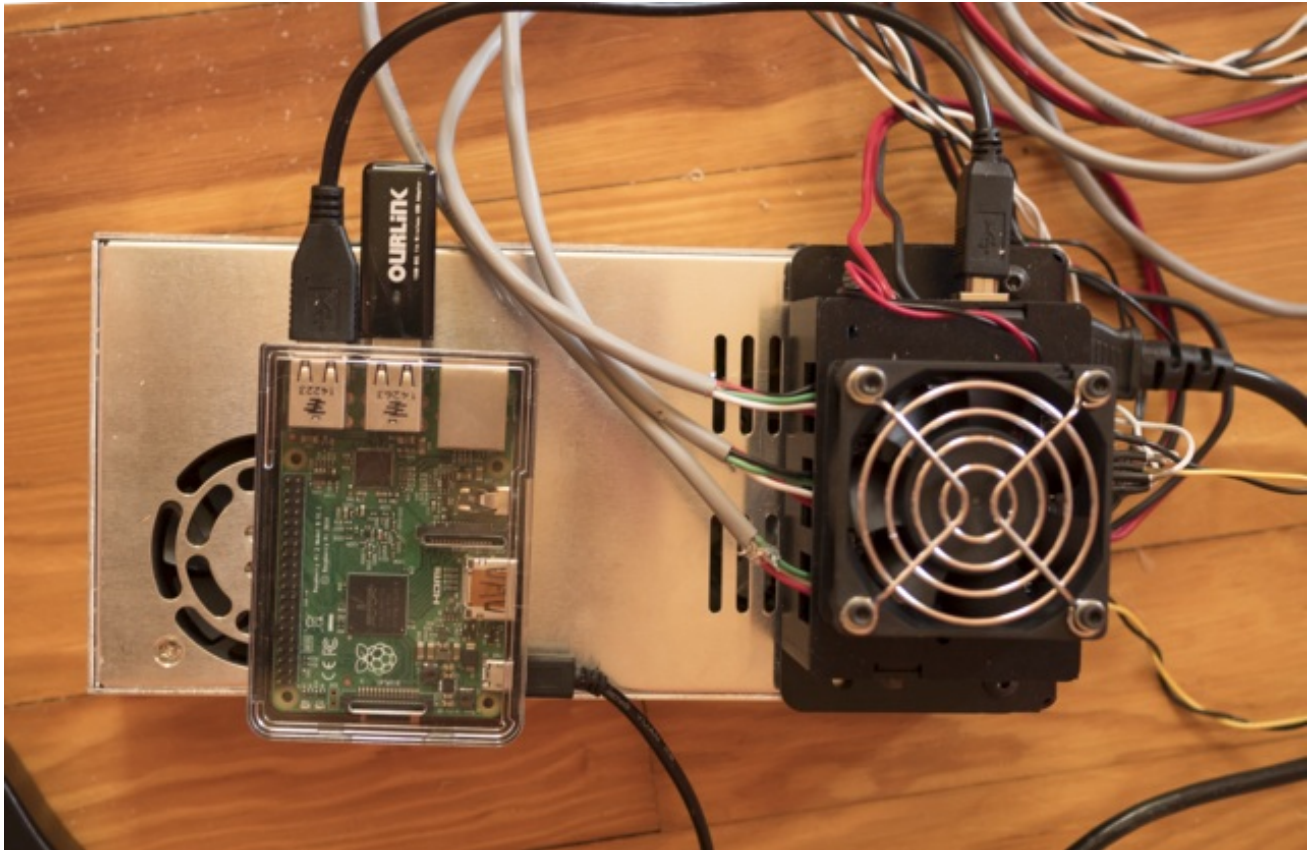
```
pi@xcarve: ~  
/usr/local/bin/get-forever-config -> /usr/local/lib/node_modules/forever-service  
/bin/get-forever-config  
make: Entering directory '/usr/local/lib/node_modules/xcarve-server/node_modules  
/serialport/build'  
CXX(target) Release/obj.target/serialport/src/serialport.o  
CXX(target) Release/obj.target/serialport/src/serialport_unix.o  
CXX(target) Release/obj.target/serialport/src/serialport_poller.o  
SOLINK_MODULE(target) Release/obj.target/serialport.node  
COPY Release/serialport.node  
COPY /usr/local/lib/node_modules/xcarve-server/node_modules/serialport/build/s  
erialport/v1.7.4/Release/node-v14-linux-arm/serialport.node  
TOUCH Release/obj.target/action_after_build.stamp  
make: Leaving directory '/usr/local/lib/node_modules/xcarve-server/node_modules/  
serialport/build'  
/usr/local/bin/xcarve-server -> /usr/local/lib/node_modules/xcarve-server/cli  
forever-service@0.5.3 /usr/local/lib/node_modules/forever-service  
├─ commander@2.3.0  
├─ async@0.9.2  
├─ walker@1.0.7 (makeerror@1.0.11)  
├─ shelljs@0.3.0  
└─ swig@1.4.2 (optimist@0.6.1, uglify-js@2.4.24)  
  
xcarve-server@1.0.0-beta /usr/local/lib/node_modules/xcarve-server  
├─ commander@2.8.1 (graceful-readlink@1.0.1)  
├─ underscore@1.4.4  
├─ onoff@1.0.2 (epoll@0.1.13)  
├─ socket.io@1.3.6 (debug@2.1.0, has-binary-data@0.1.3, socket.io-adapter@0.3.1  
, engine.io@1.5.2, socket.io-client@1.3.6, socket.io-parser@2.2.4)  
└─ serialport@1.7.4 (bindings@1.2.1, sf@0.1.7, async@0.9.0, debug@2.2.0, nan@1.  
8.4, optimist@0.6.1)  
pi@xcarve ~ $
```

Once the service has been started, quit the SSH session by typing **exit** at the prompt and pressing return. You can then power down the Raspberry Pi by pressing the red **Shutdown** button in the main Pi Finder window.

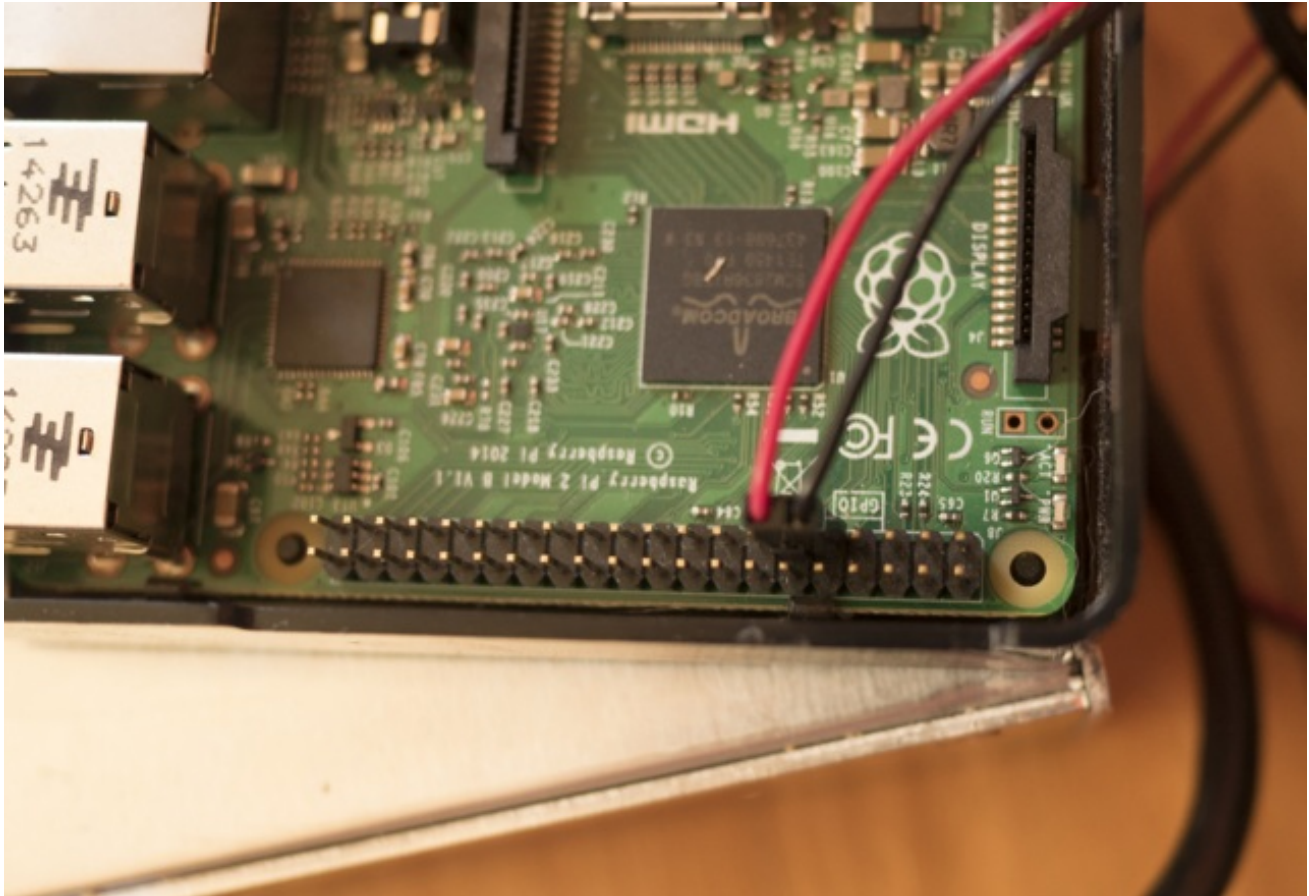


Connecting the X-Carve to the Raspberry Pi

Next, remove the ethernet cable from the Pi, and unplug the Pi from the wall. Move the Pi near your X-Carve power supply, and attach the X-Carve's Arduino Uno to the Pi using a short USB Type A to B cable. Don't power on the Raspberry Pi yet.



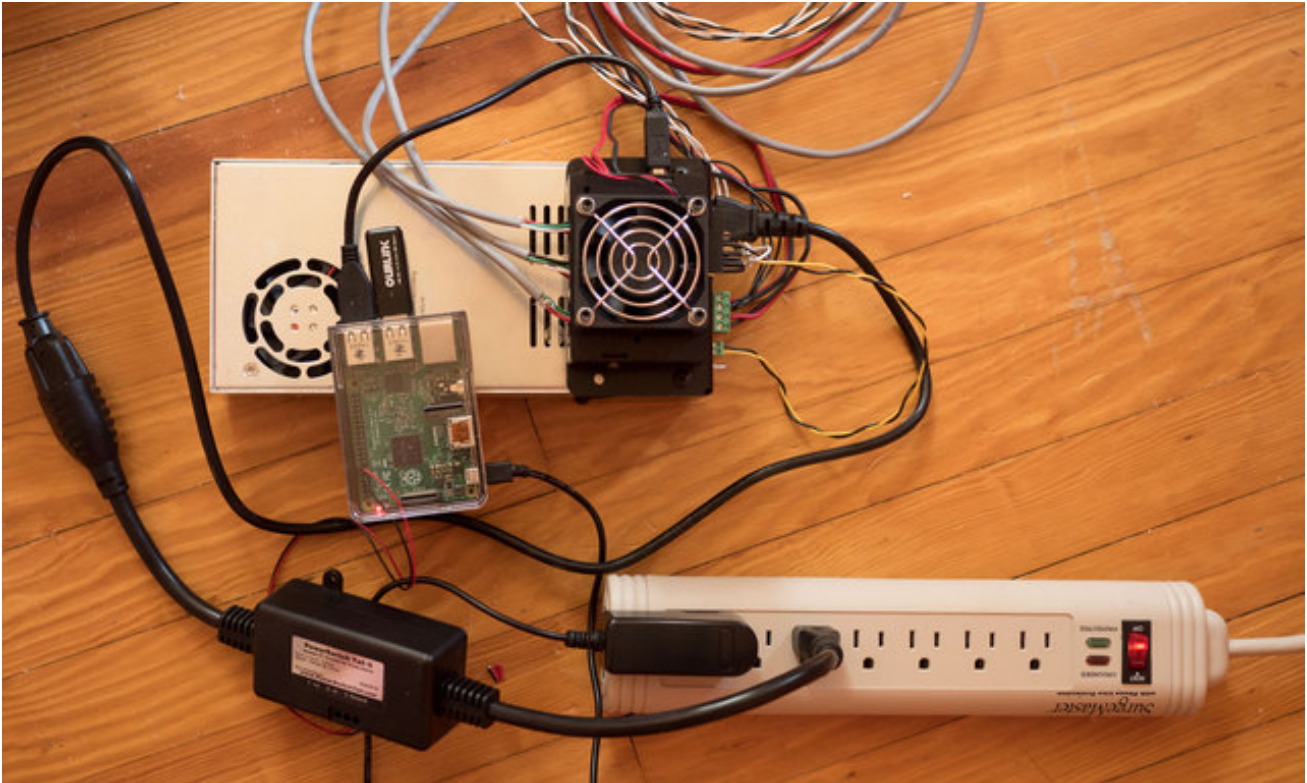
Next, we will connect the Powerswitch Tail to the Raspberry Pi using the Female to Male jumper cables. Attach the female end of one jumper cable to a **GND** pin on the Pi, and the female end of a second jumper cable to **GPIO 17** on the Pi. Check out [this pin diagram \(http://adafru.it/fQk\)](http://adafru.it/fQk) if you need help locating the appropriate pins on the Raspberry Pi.



Plug in the male side of the **GPIO 17** jumper wire to the **1: +in** connector on the Powerswitch Tail. Then, plug in the male side of the **GND** jumper wire to the **2: -in** connector on the Powerswitch Tail.



Plug the power cord from the X-Carve power supply into the Powerswitch Tail, and then plug in the Powerswitch Tail into an outlet. Flip the X-Carve power supply into the on position, and plug in your Raspberry Pi to a power outlet. From now on the Raspberry Pi will be controlling the power to your X-Carve.



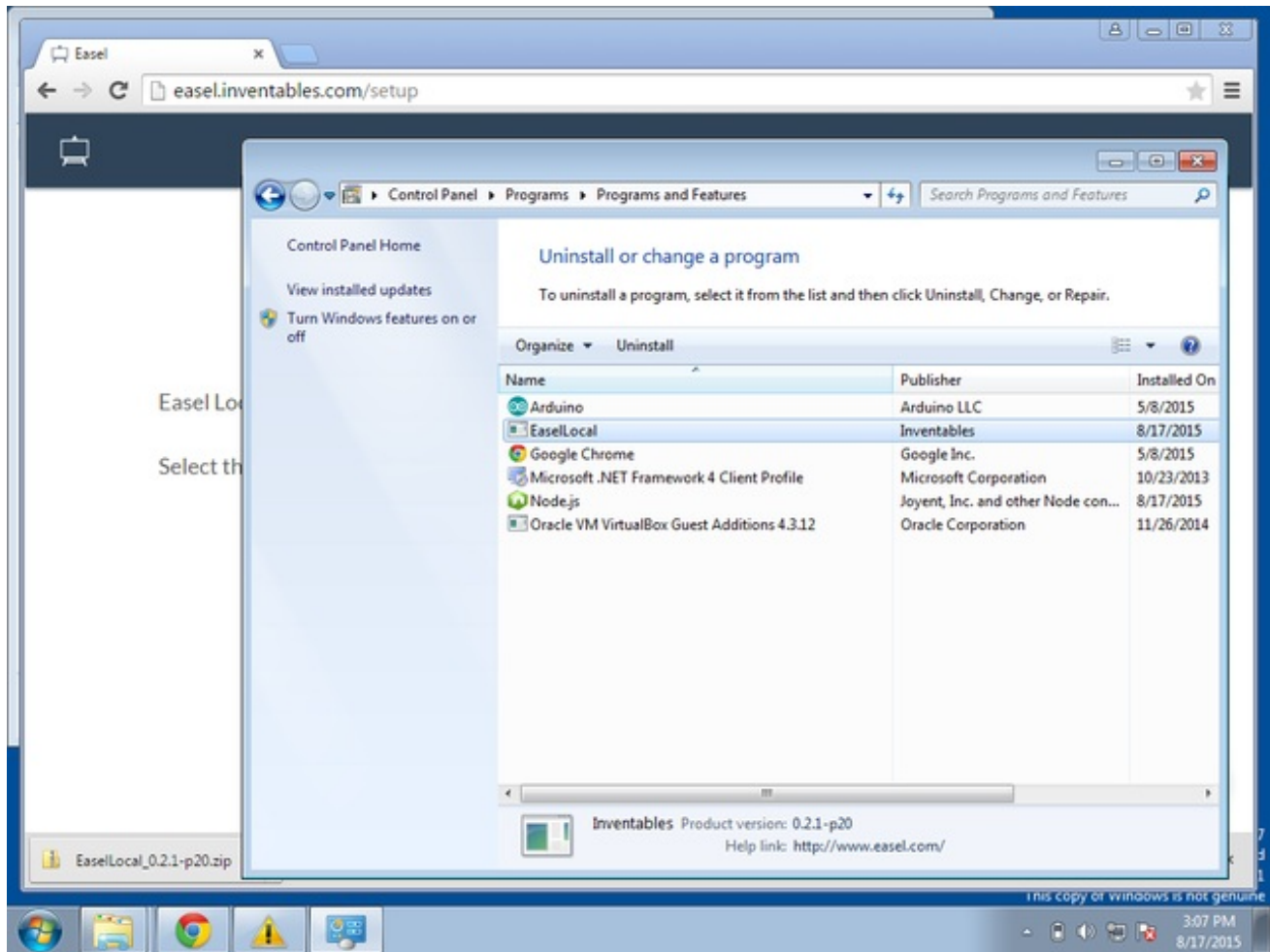
Disabling the Local Easel Install

You will need to disable the local install of Easel on your computer in order to use the proxy. Follow the instructions for OS X or Windows to remove the software from your computer.

If you are running **OS X**, you will need to disable the local copy of Easel by running the following command in the terminal.

```
sudo launchctl unload -w /Library/LaunchDaemons/com.Iris.Iris.plist
```

If you are running **Windows**, you will need to disable the local copy of Easel by uninstalling EaselLocal from the Control Panel.



Installing the Proxy

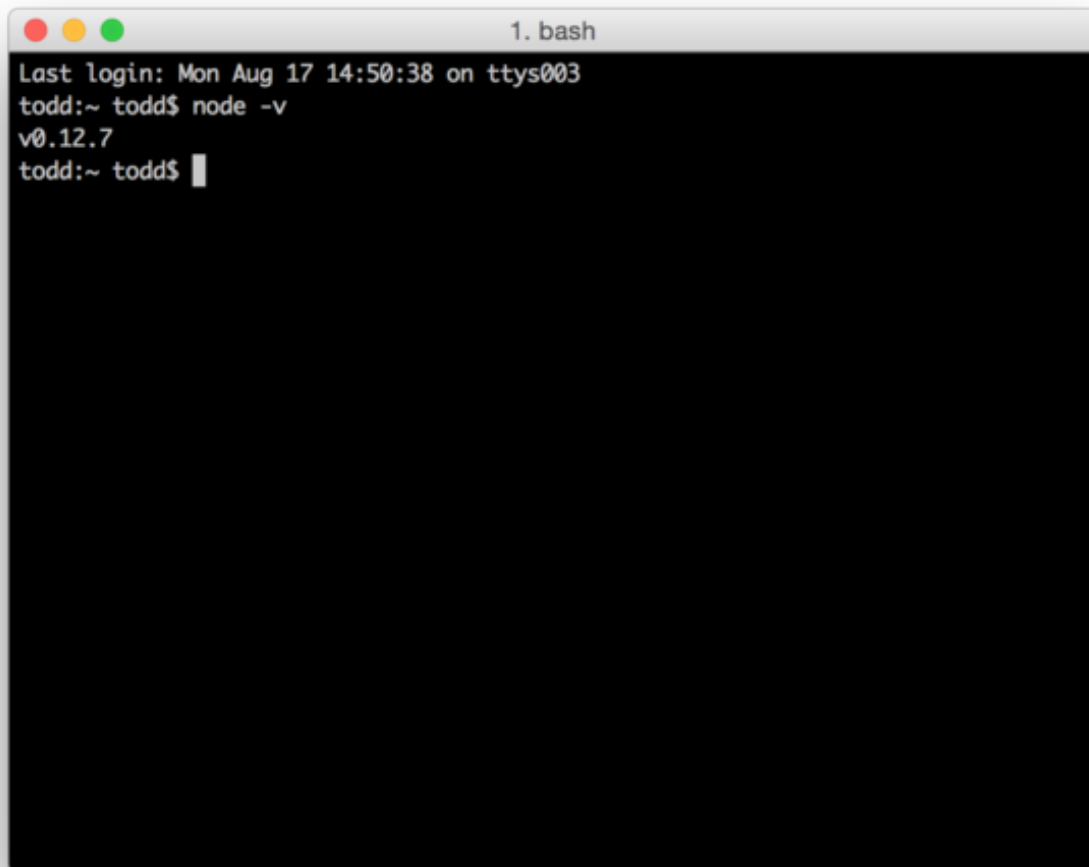
Next, you will need to install a simple proxy on your computer that will relay traffic between easel.inventables.com and your Raspberry Pi. First, install the latest version of Node.js for your operating system.

Node.js Download

<http://adafru.it/fQI>

After installation, confirm that you have the latest version by opening the terminal on OS X & Linux, or the command prompt in Windows. Run the following command to confirm that you are running Node.js v0.12.7 or higher.

```
node -v
```

A terminal window titled "1. bash" with a black background and white text. The window shows the following text: "Last login: Mon Aug 17 14:50:38 on ttys003", "todd:~ todd\$ node -v", "v0.12.7", and "todd:~ todd\$ " followed by a cursor. The window has standard macOS window controls (red, yellow, green buttons) in the top left corner.

```
1. bash
Last login: Mon Aug 17 14:50:38 on ttys003
todd:~ todd$ node -v
v0.12.7
todd:~ todd$ 
```

Next, install the **forever** and **xcarve-proxy** packages using npm.

```
npm install -g forever xcarve-proxy
```

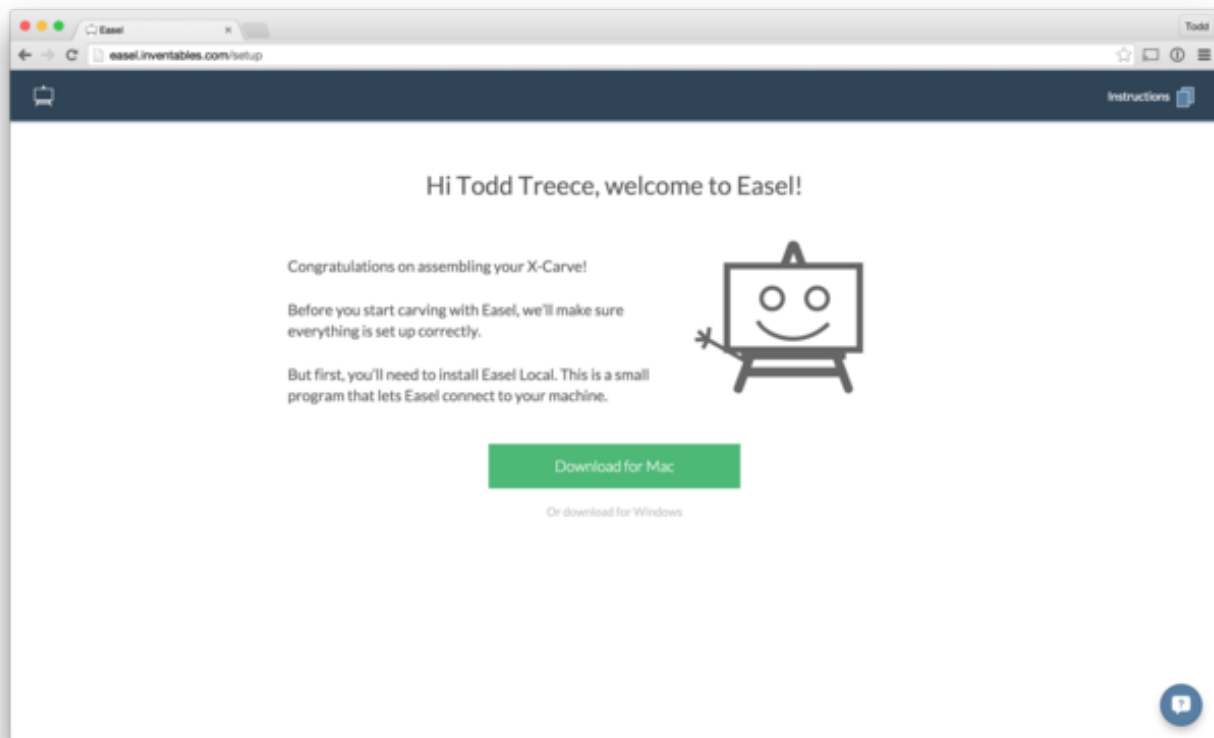
Finally, start the proxy.

```
xcarve-proxy start
```

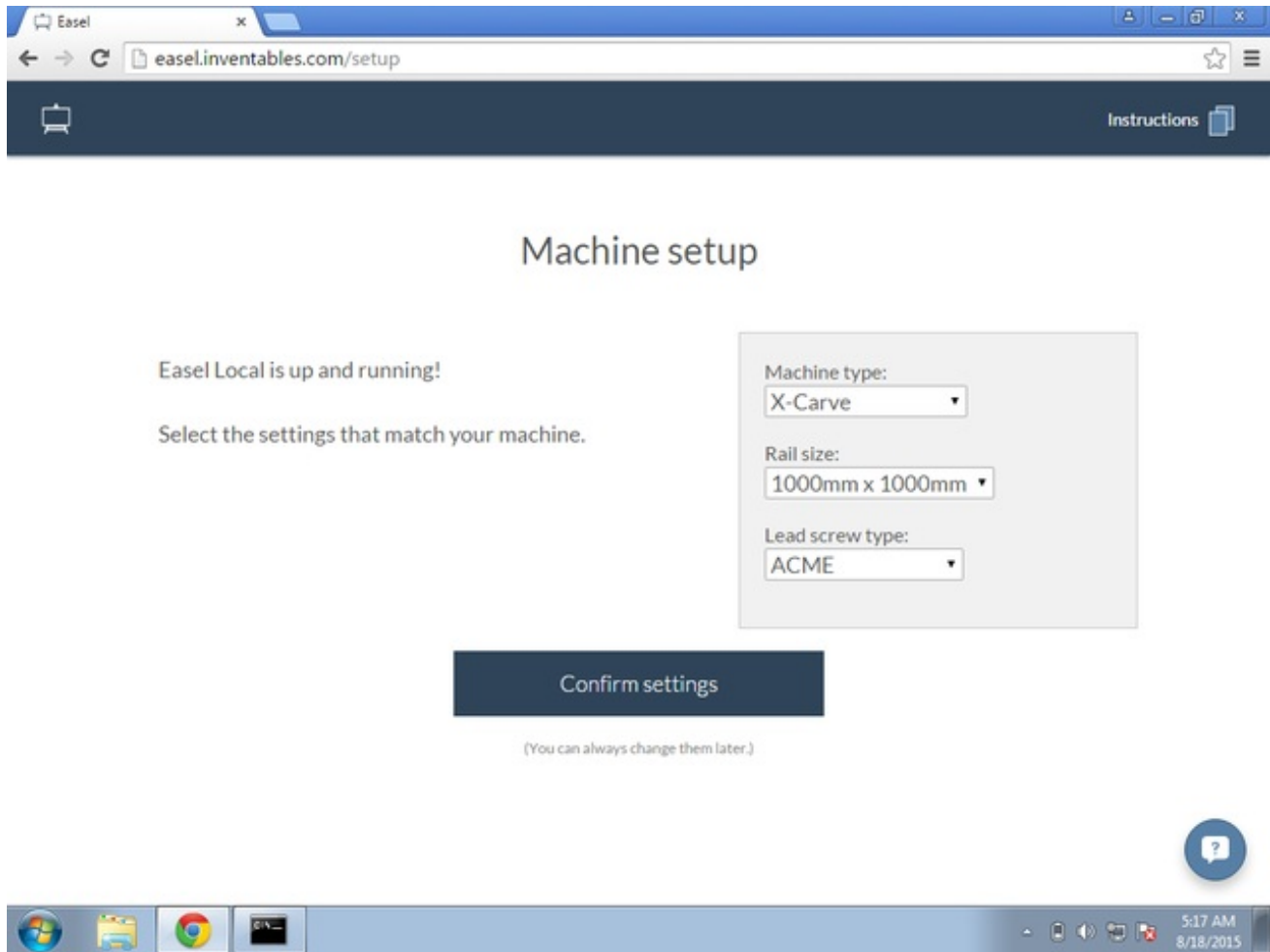
```
2. bash
todd:~ todd$ npm install -g xcarve-proxy
/usr/local/bin/xcarve-proxy -> /usr/local/lib/node_modules/xcarve-proxy/cli
xcarve-proxy@1.0.1 /usr/local/lib/node_modules/xcarve-proxy
├─ commander@2.8.1 (graceful-readlink@1.0.1)
└─ http-proxy@1.11.1 (eventemitter3@1.1.1, requires-port@0.0.1)
todd:~ todd$ xcarve-proxy
```

Testing Communication

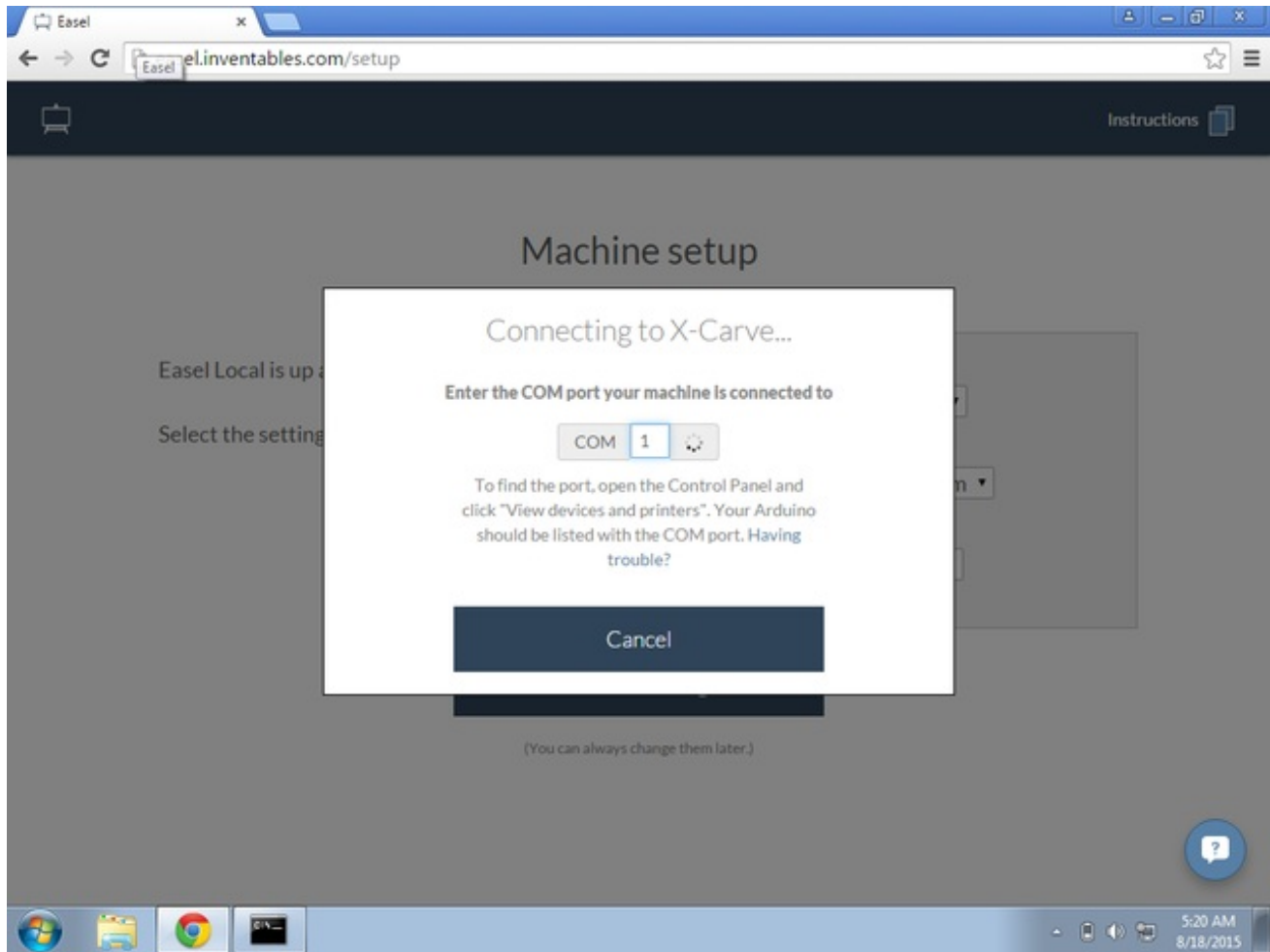
Now that you have the server and proxy started, you can visit easel.inventables.com/setup (<http://adafru.it/fQm>) to test communication. It might take a few seconds for the connection to be established. You will see a download screen like the one shown below until Easel establishes communication with the X-Carve.



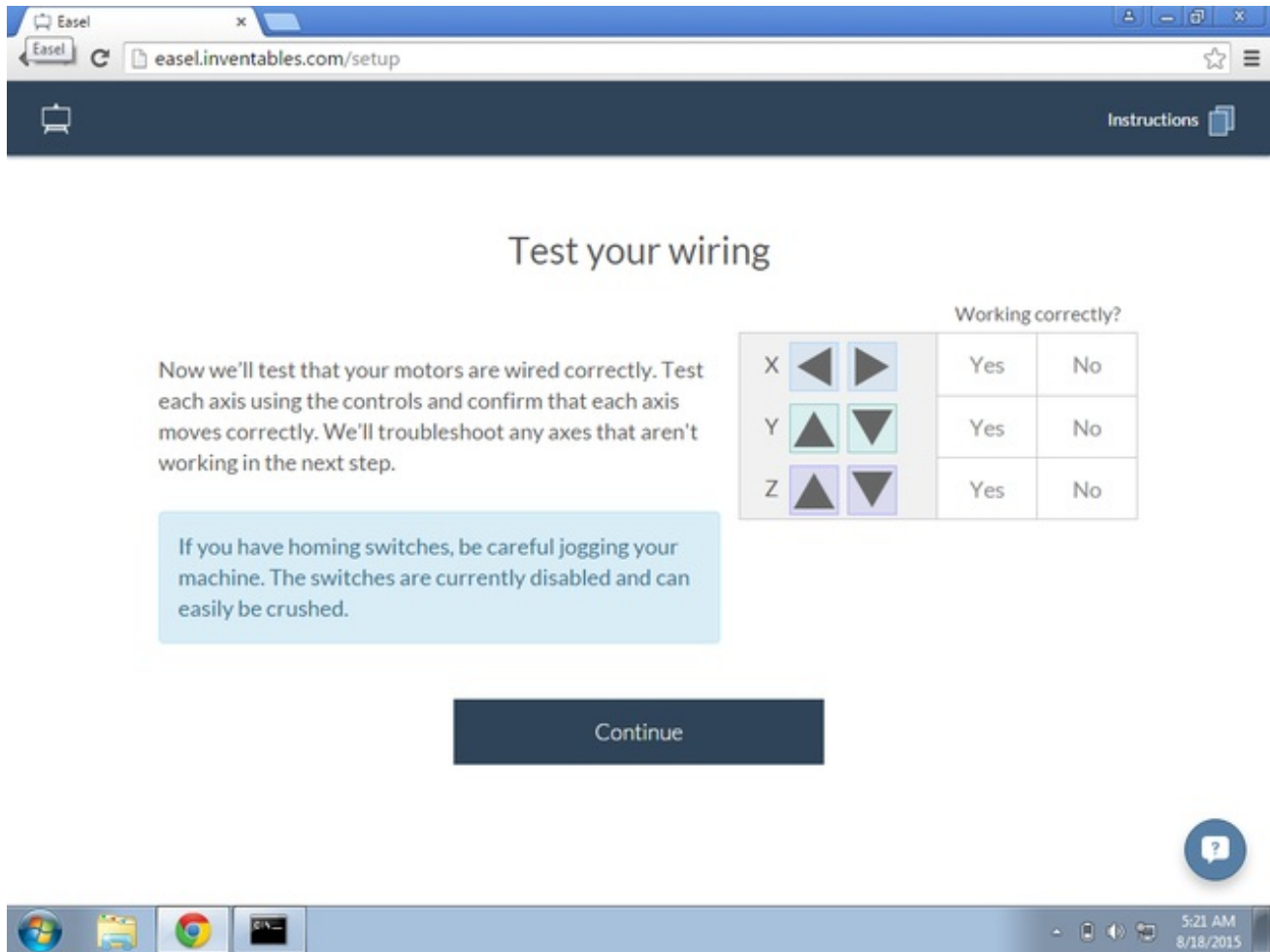
You will then see the normal X-Carve setup screen once Easel connects to the Raspberry Pi. Click **Confirm settings** once you have set the appropriate settings for your machine.



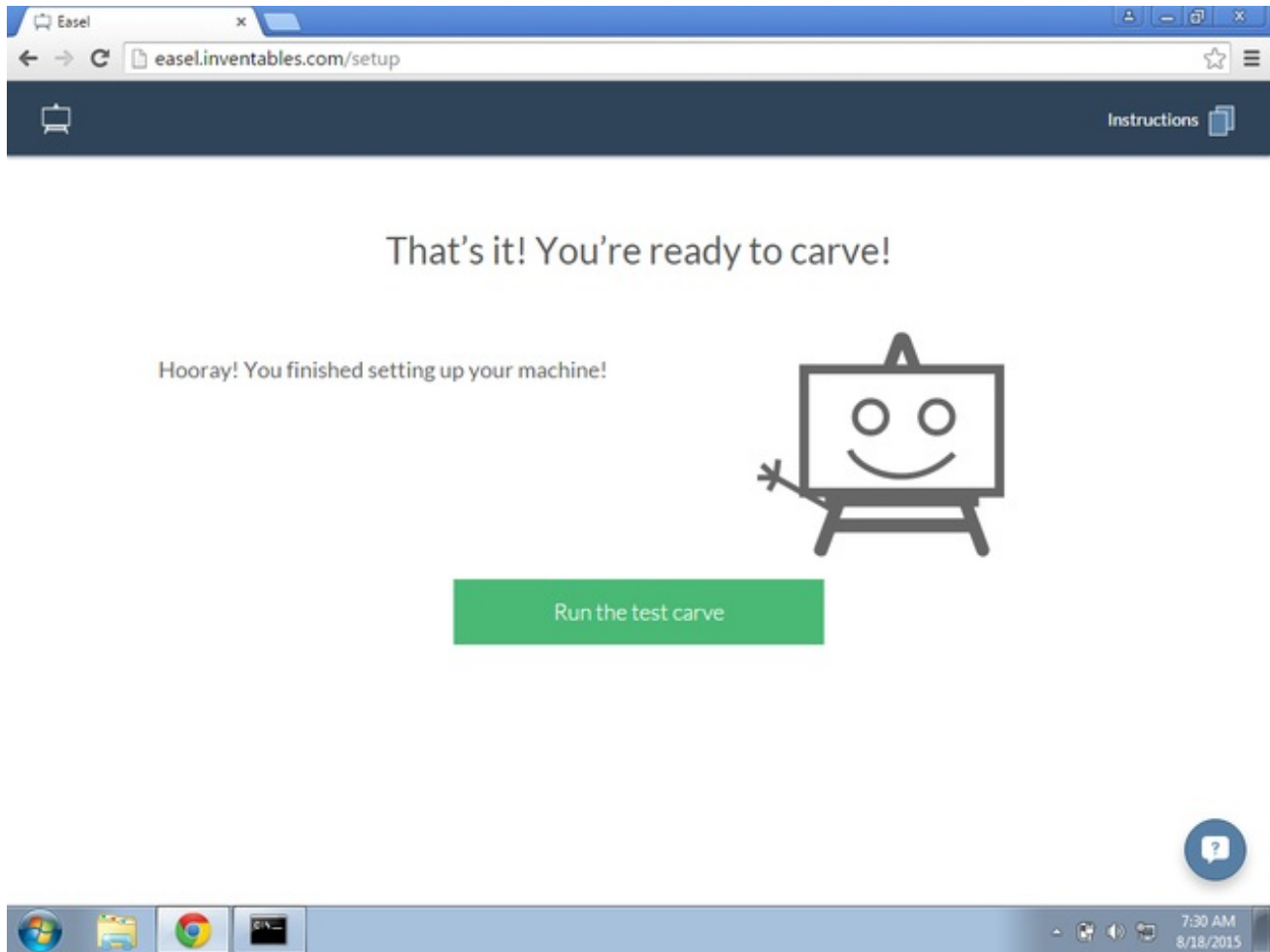
Windows only: You will need to enter a fake COM port when Easel prompts you to enter one. Any number will do here since the Arduino is connected to the Raspberry Pi.



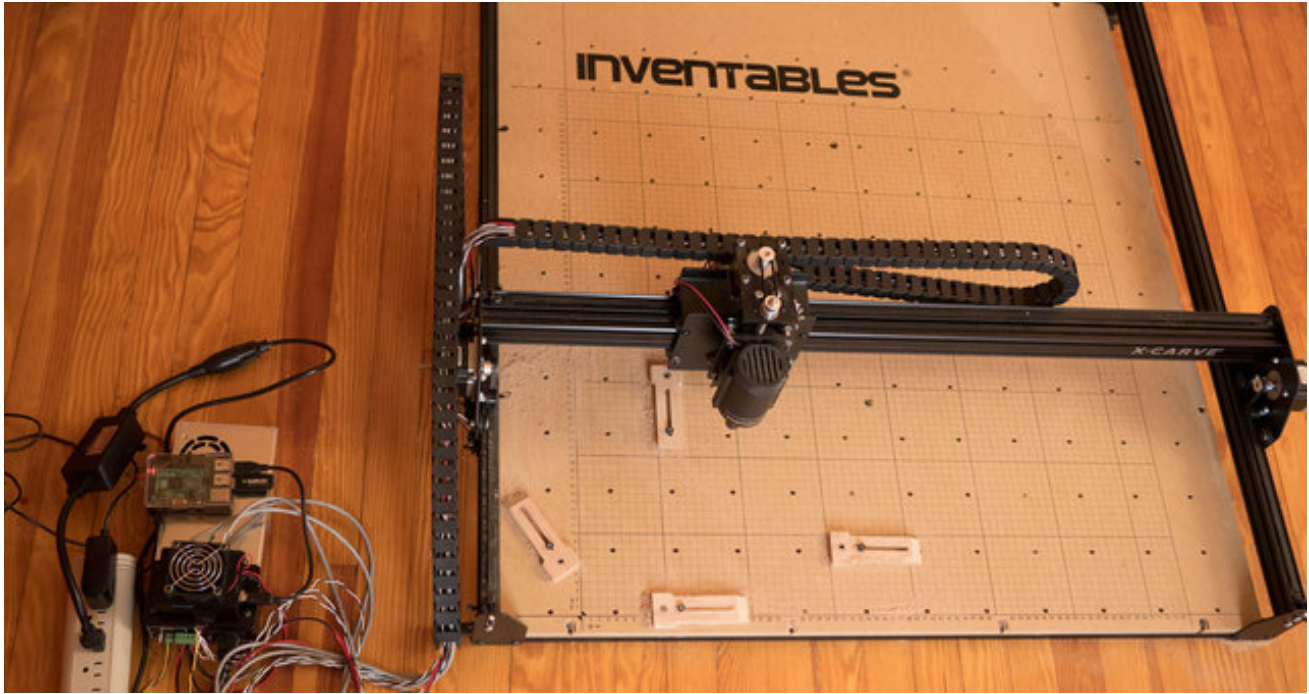
You should then see a screen that will allow you to test communication between Easel and the X-Carve. Use the arrows on the screen to test the stepper motors.



Finish the rest of the install process, and try a test carve to make sure everything is working.



Final Thoughts



The **xcarve-server** service will automatically restart when your Raspberry Pi starts, but you will need to start the local **xcarve-proxy** daemon on your computer after a restart. If you need to stop either the proxy or server, just run **xcarve-server stop** or **xcarve-proxy stop** to kill the processes.

You can find the source to both of the modules using the links below.

xcarve-proxy on GitHub

<http://adafru.it/fQn>

xcarve-server on GitHub

<http://adafru.it/fQo>