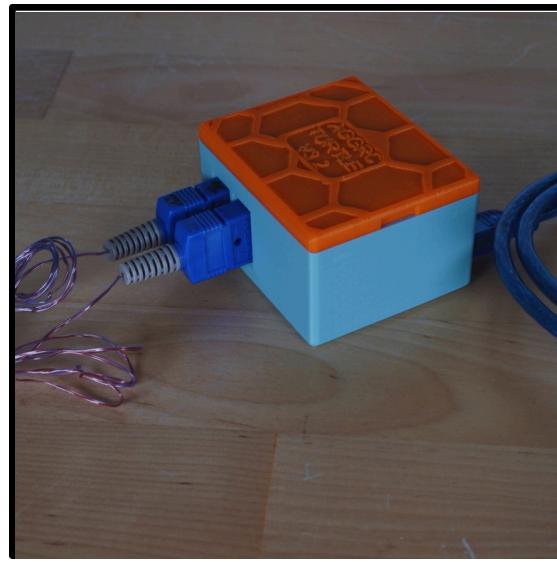


<b>Aquatic Germplasm and Genetic Resources Center</b>	<b>INSTITUTION</b> LSU AgCenter	<b>PROCEDURE ID:</b>
	<b>MANUAL</b> Open Hardware	<b>EFFECTIVE DATE:</b>
	<b>SUBJECT</b> TURTLE V3.6 User Manual	<b>REVISED/REVIEW:</b>

# TURTLE V3.6 User Manual



## Technical Support:

Cole Brumfield, (cbrum16@lsu.edu)

*Please send us your comments and suggestions!*



*Scan to learn  
more about the AGGRC!*

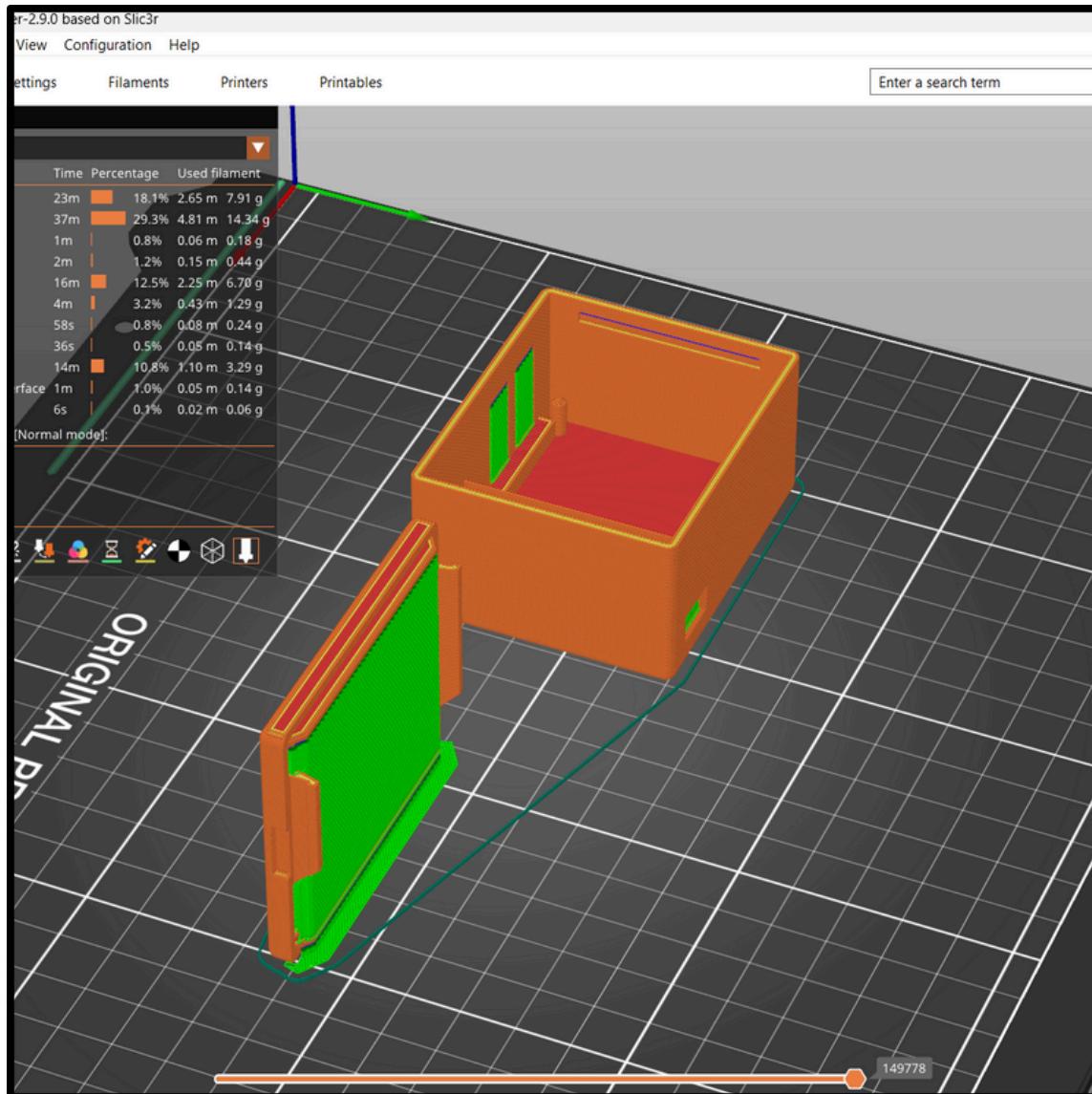
# Table of Contents

**\*Note: If receiving an assembled TURTLE skip to the TURTLE App Setup section (page 11)**

Page #	Content
1	Printing Orientation
2	TURTLE Materials List
3-6	Assembly
7-11	Uploading Arduino Code
12	TURTLE App Setup
13-14	Using TURTLE App

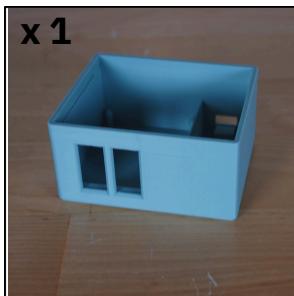


# Printing Orientation

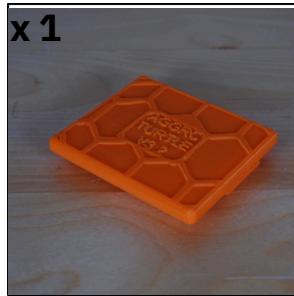


It is recommended to print the case in this orientation. Supports are also necessary (in green)

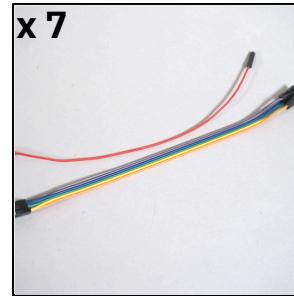
# TURTLE Materials



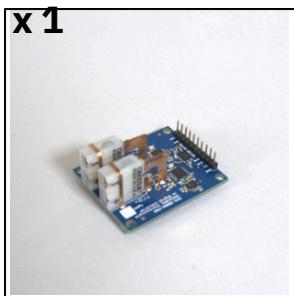
Case (Base)  
**\*Required**



Case (Cover)  
**\*Required**



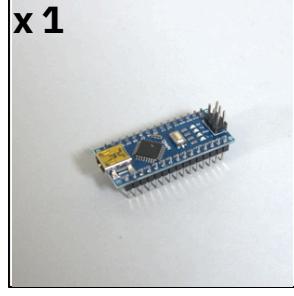
Breadboard  
wires(female-female)  
**\*Required**



2-Channel  
MAX31856  
Breakout  
**\*Required**

Link:

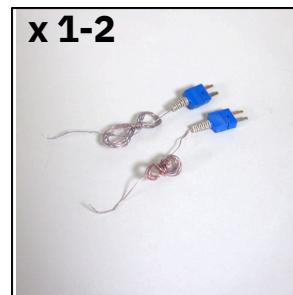
[https://www.playing  
withfusion.com/produc  
tview.php?  
pdid=62&catid=1004](https://www.playingwithfusion.com/productview.php?pdid=62&catid=1004)



Arduino Nano  
(ATmega328P)  
**\*Required**



USB-A to Mini USB  
Cable  
**\*Required**



Any type  
thermocouple  
**\*Required**

**\*3-D files can be found at:**  
[https://github.com/Colebrum  
field/TURTLE-Device](https://github.com/Colebrumfield/TURTLE-Device)

**\*Note:** Color will vary for 3-D  
printed parts and breadboard  
wires



# Assembly

## Step 1: Attach Wires between boards

Using breadboard wires make the following connections between the Thermocouple Board(MAX31856) and the Arduino Nano.

\*Note: Breadboard wire color may vary

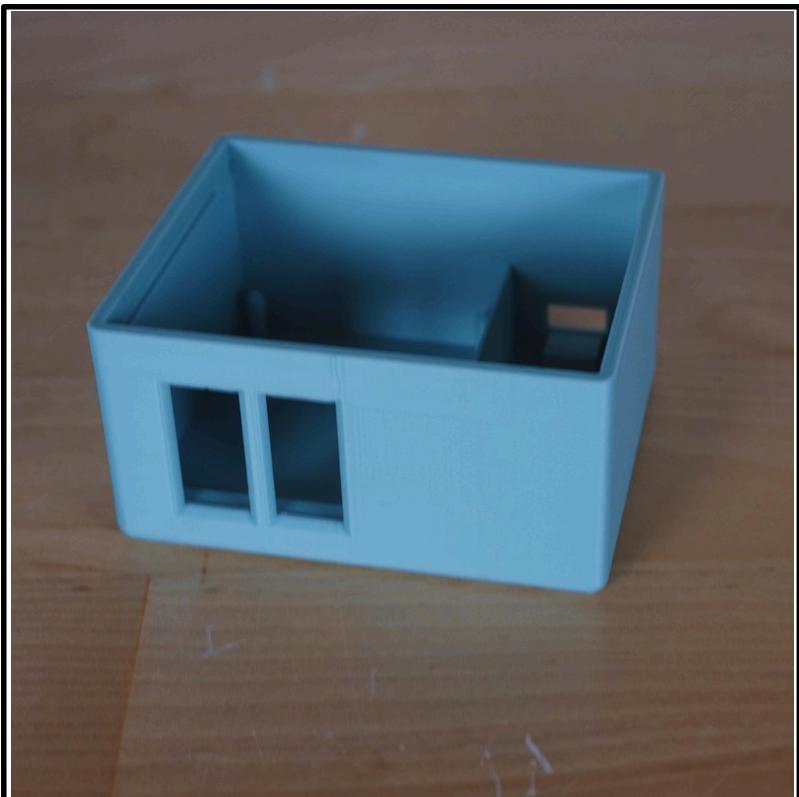
Thermocouple Board	Breadboard Wire	Arduino Nano
GND		GND
V+		VIN
CS0		D9
SCK		D13
SDO		D12
SDI		D11
CS1		D10



# Assembly Continued

## **Step 2: Orientate the MAX31856 inside of the case**

Push the MAX31856 board into the left side of the case.



**Before**

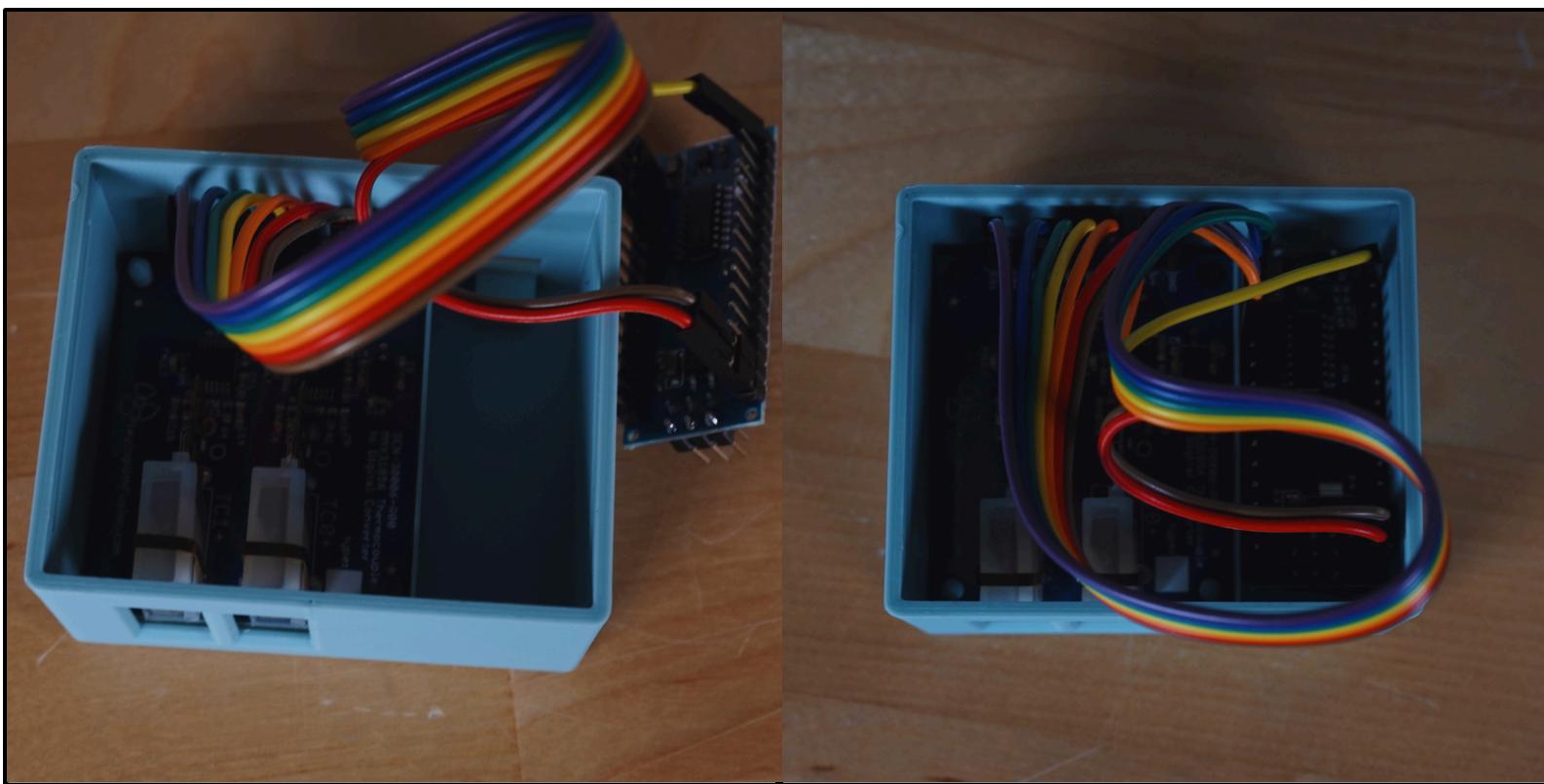


**After**

# Assembly Continued

## **Step 3: Orientate the Arduino Nano inside of the case**

Push the Arduino Nano into the right side of the case. Make sure the Arduino Nano is pushed down enough so that the port can be accessed.



**Before**

**After**

# Assembly Continued

## Step 4: Snap on cover

Snap the cover onto the case. It is easier to start with one side aligned.



**Before**



**After**

# Uploading Arduino Code

## **Step 1: Download the Arduino IDE**

Download the Arduino IDE here: <https://www.arduino.cc/en/software>. Once downloaded, install the program.

## **Step 2: Download Files**

Navigate to the GitHub:

<https://github.com/Colebrumfield/TURTLE-Device/releases/tag/v3.6>

From there download:

1. **TURTLE\_AppV3.6.zip**
2. **Source code(zip)**

Extract both folders

## **Step 3: Open Arduino Code**

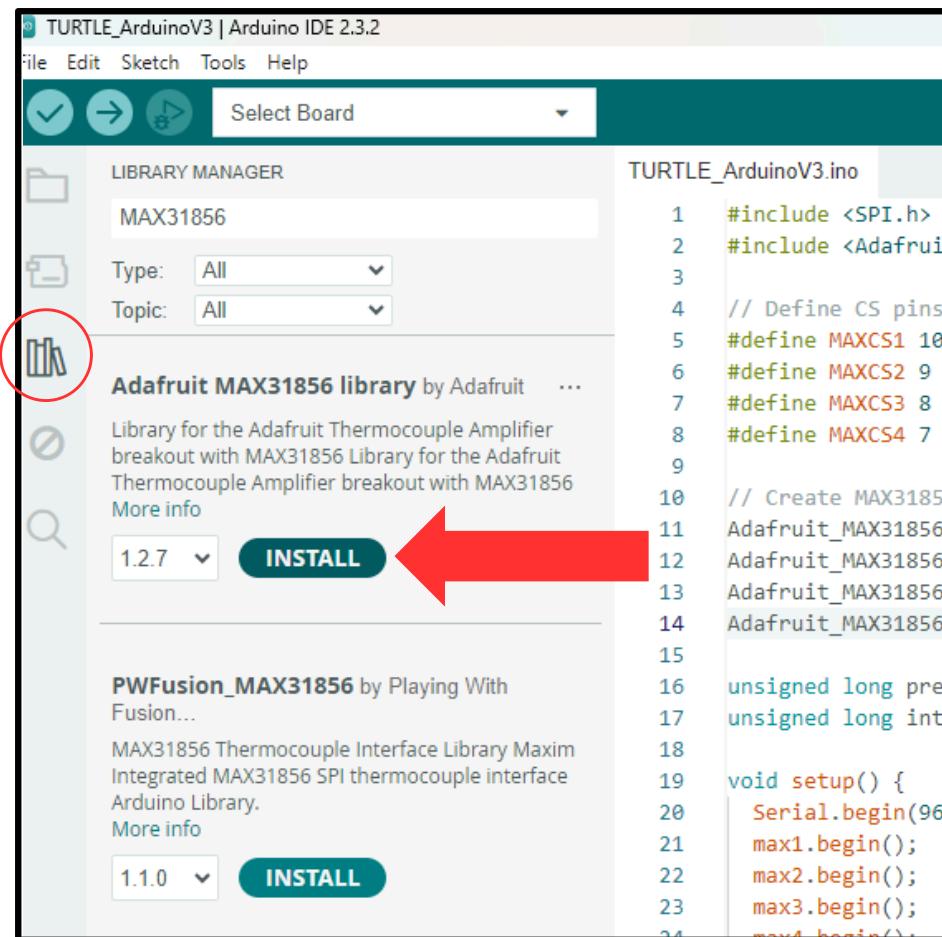
Navigated to the extracted Source code folder. From there open the file named “TURTLE\_ArduinoV3.ino” using the Arduino IDE



# Uploading Arduino Code

## Step 4: Install Libraries

Inside the Arduino IDE click on the icon (that looks like books) on the left. Type in the search bar “MAX31856”. Click install under the version titled “Adafruit MAX31856 library”.

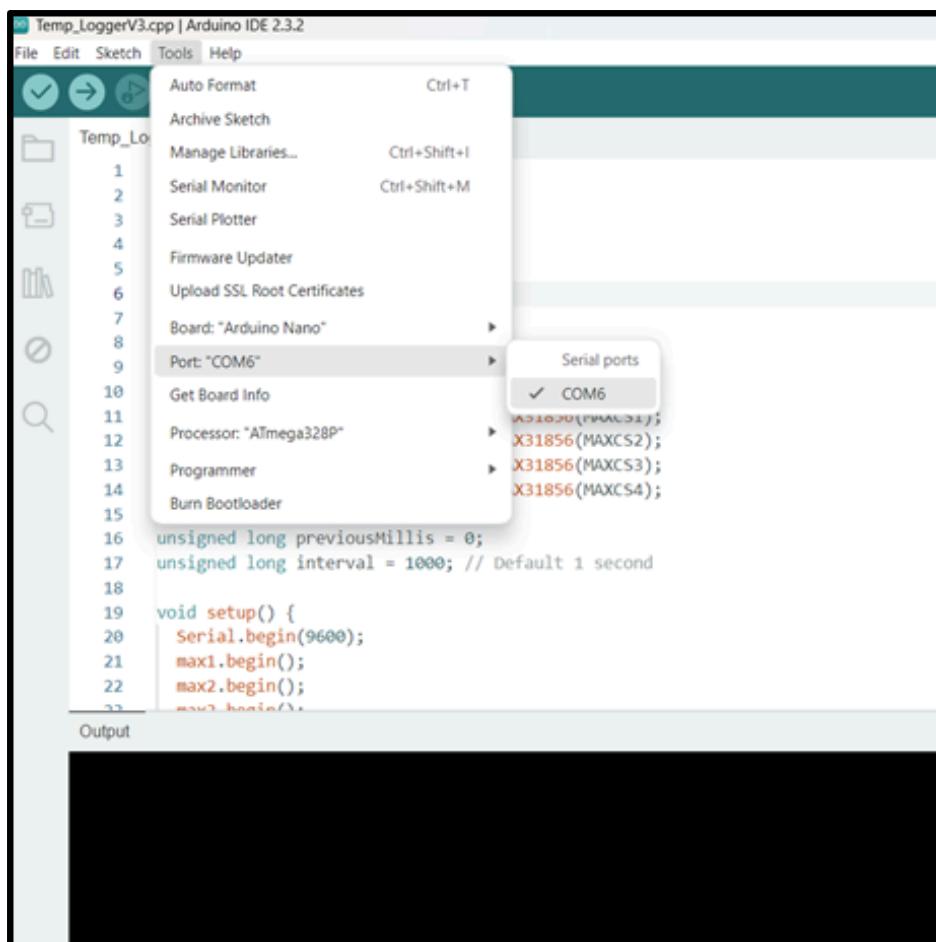


# Uploading Arduino Code

## Step 5: Selecting port

Plug in the TURTLE Device to your laptop/pc using the USB cable. Inside the Arduino IDE push the “Tools” drop down menu. Select “Port:”. From there select the port assigned to your Arduino.

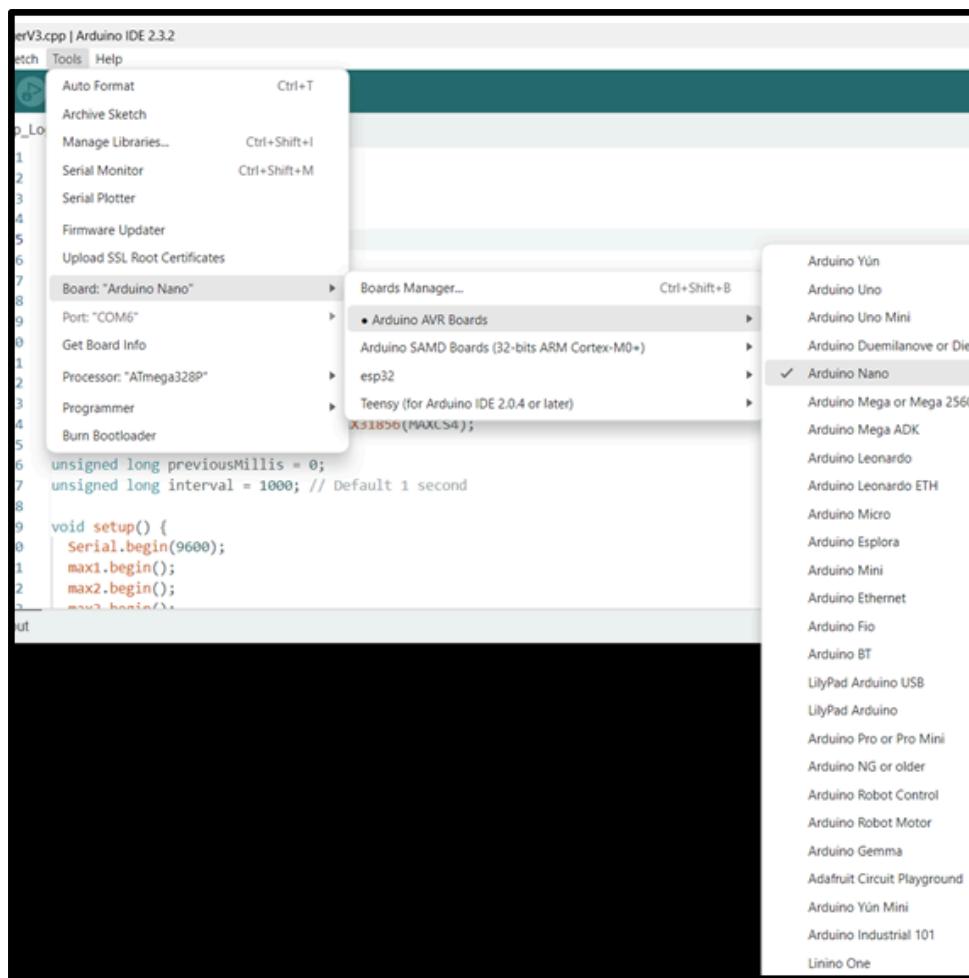
\*Note: Multiple ports may appear (from mice, keyboards, etc.)



# Uploading Arduino Code

## Step 6: Selecting Board

Push the “Tools” drop down menu. From the tools drop down navigate to “Board:” and then “Arduino AVR Boards” and select “Arduino Nano”

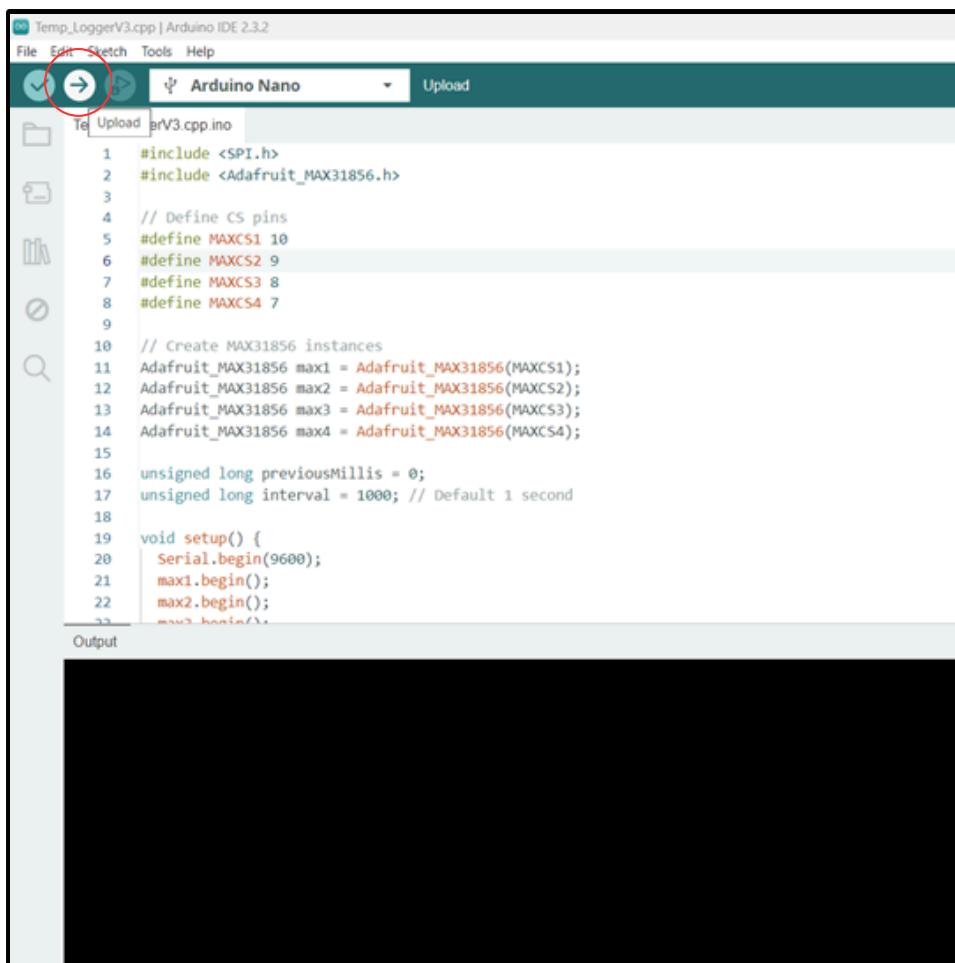


# Uploading Arduino Code

## Step 7: Uploading Code

Finally push the arrow button at the top left of the screen which will flash the code onto the Arduino.

\***Note:** If uploading process takes a long time you may have selected the wrong port. Choose a different port and push the upload arrow again.



# TURTLE App Setup

**\*Note:** This step is only for those receiving a TURTLE fully assembled with a USB drive with files. If you are not you should have already downloaded all the necessary files previously in the Uploading Arduino Code section (page 7)

## **Step 1: Download the Files**

Navigate to the GitHub:

<https://github.com/Colebrumfield/TURTLE-Device/releases/tag/v3.6>

From there download:

1. **TURTLE\_AppV3.6.zip**
2. **Source code(zip)**

Extract both folders



# TURTLE App Setup

## **Step 2: Download the Driver**

Navigated to the extracted Source code folder. From there open the folder named “Windows-CH340-Driver”. Once inside the folder double click the file named “SETUP” to install the driver. This is a driver which will allow your laptop/pc to connect to the TURTLE

## **Step 3: Run the App**

Plug in the TURTE Device to your laptop/pc. Navigate to the previously extracted folder named “TURTLE\_AppV3.6” Open the folder and run the application inside.

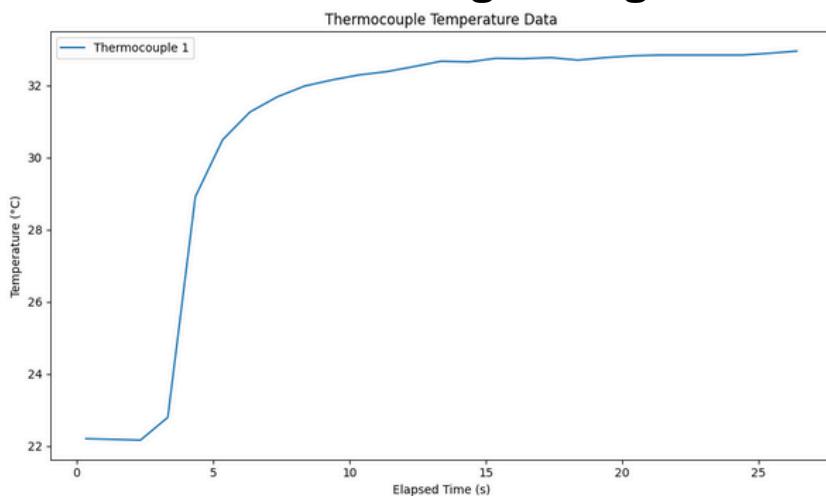


# Using TURTLE App

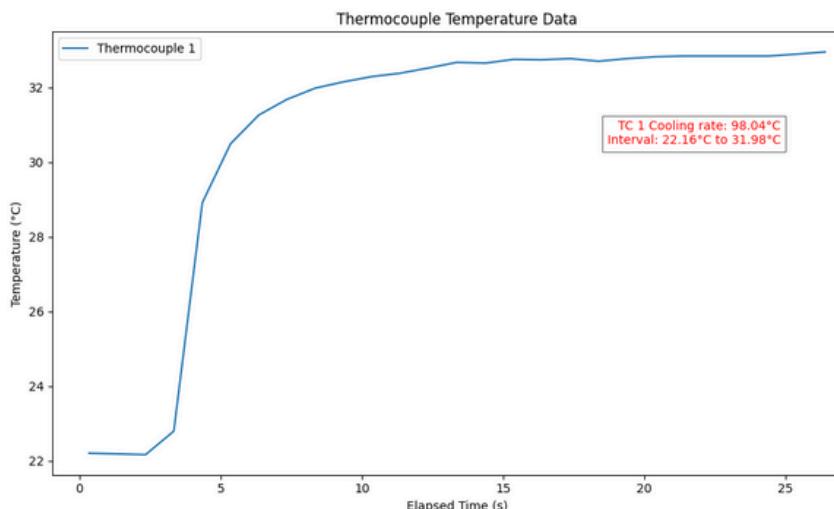
\*Note: The TURTLE must be connected to a laptop/pc at all times to function. The TURTLE has no on board memory or power yet.

## Calculating Cooling Rate:

The check box next to “Calculate Cooling Rate” must be checked in order for graphs and excel documents to display cooling rate. Use the start temp and ending temp entry boxes to enter the interval in question. Make sure you are entering the correct temperature unit into these boxes. The resulting cooling rate will be in F or C/min



**Without  
“Calculate Cooling Rate”  
checked**



**With  
“Calculate Cooling Rate”  
checked**



# Using TURTLE App

## Exporting Options:

Data can be exporting either as excel or graph. When saving as a graph push the “Graph Last Data Points” button and then push the save icon in the top left.  When saving as an excel file push the “Export Last Data to Excel” button. Then choose where to save the file.

## Problems Installing Driver:

You will need admin access to download this driver. This is a windows driver which is used to communicate with the board inside of the TURTLE. Drivers for different operating systems can be found on the GitHub

## Changing Temperature Unit:

Push the settings button. From there switch to the desired temperature unit and push apply. This will change the temperature unit used in graphing, exporting to excel, and calculating cooling rate.

## Thermocouple Connection Issues:

Some thermocouples do not connect to the device as well as others. It is best to plug in the thermocouples into the device and then start the application.

