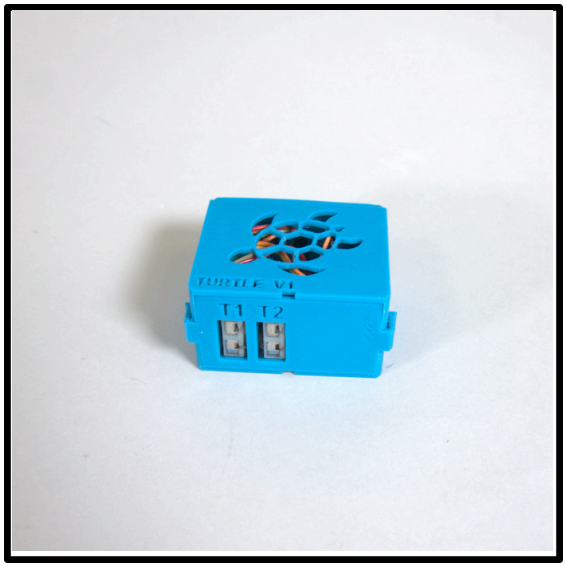
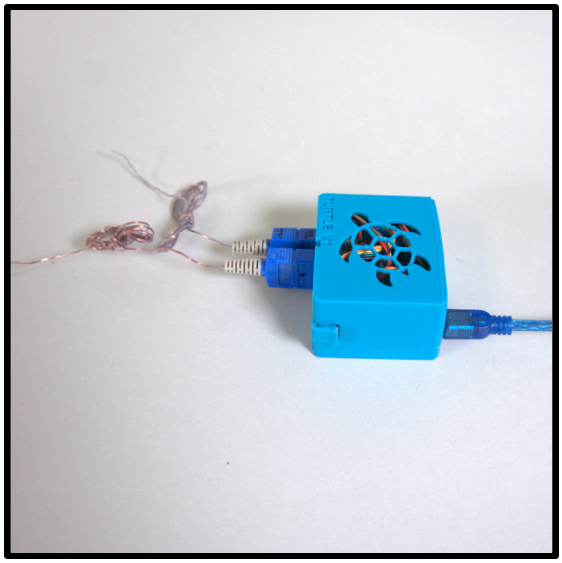
Aquatic Germplasm and Genetic Resources Center	INSTITUTION LSU AgCenter	PROCEDURE ID:
	MANUAL Open Hardware	EFFECTIVE DATE:
	SUBJECT TURTLE V3.6 User Manual	REVISED/REVIEW:

TURTLE V3.6 User Manual

AGGRC





Technical Support:

Cole Brumfield, (cbrum16@lsu.edu)

Please send us your comments and suggestions!

Scan to learn more about the AGGRC!

NIH National Institutes of Health
Office of Research Infrastructure Programs

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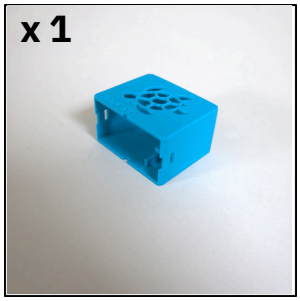
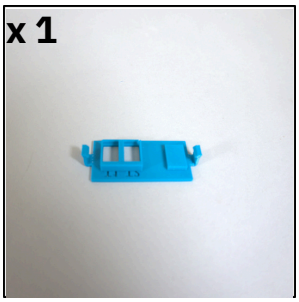
*__Note:__ If receiving a assembled TURTLE skip to the TURTLE App Setup section

TURTLE Materials



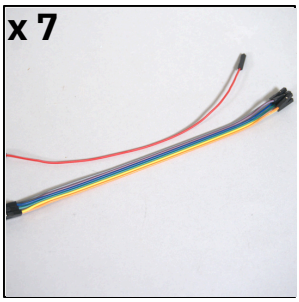
Case (Base)

***Required**



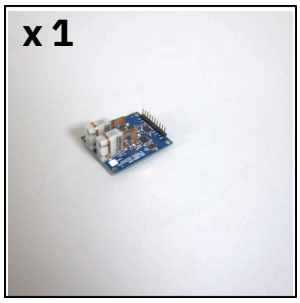
Case (Cover)

***Required**



Breadboard wires(female-female)

***Required**

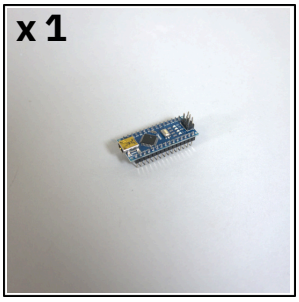


2-Channel MAX31856 Breakout

***Required**

Link:

https://www.playingwithfusion.com/productview.php?pdid=62&catid=1004

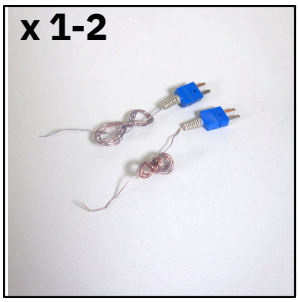


Arduino Nano (ATmega328P)

***Required**

USB-A to Mini USB Cable

***Required**



Any type thermocouple

***Required**

***3-D files can be found at:**

https://github.com/Colebrumfield/TURTLE-Device

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***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.

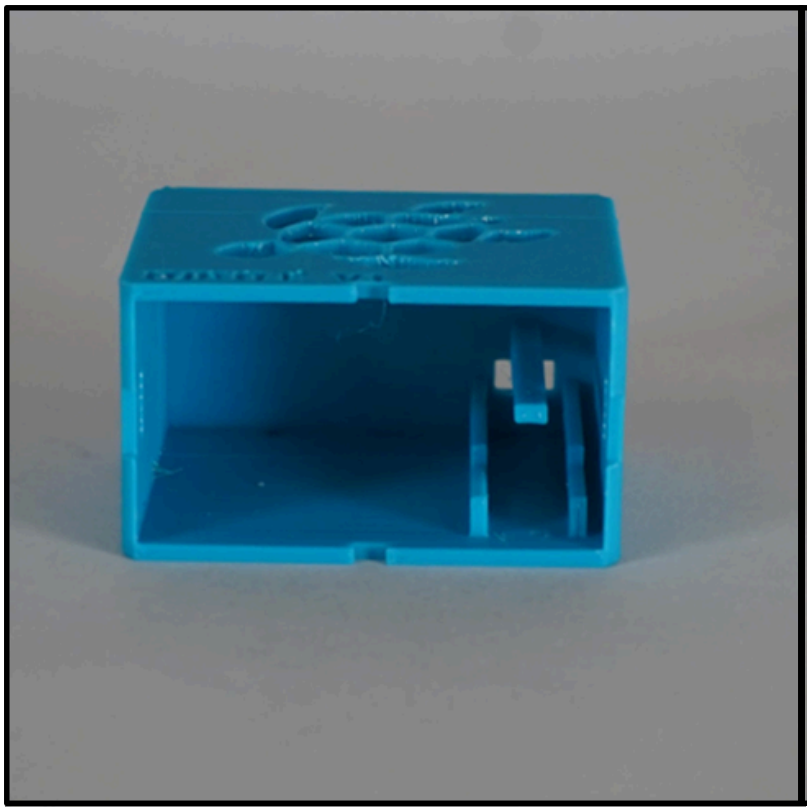
***Note:** Breadboard wire color may vary

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

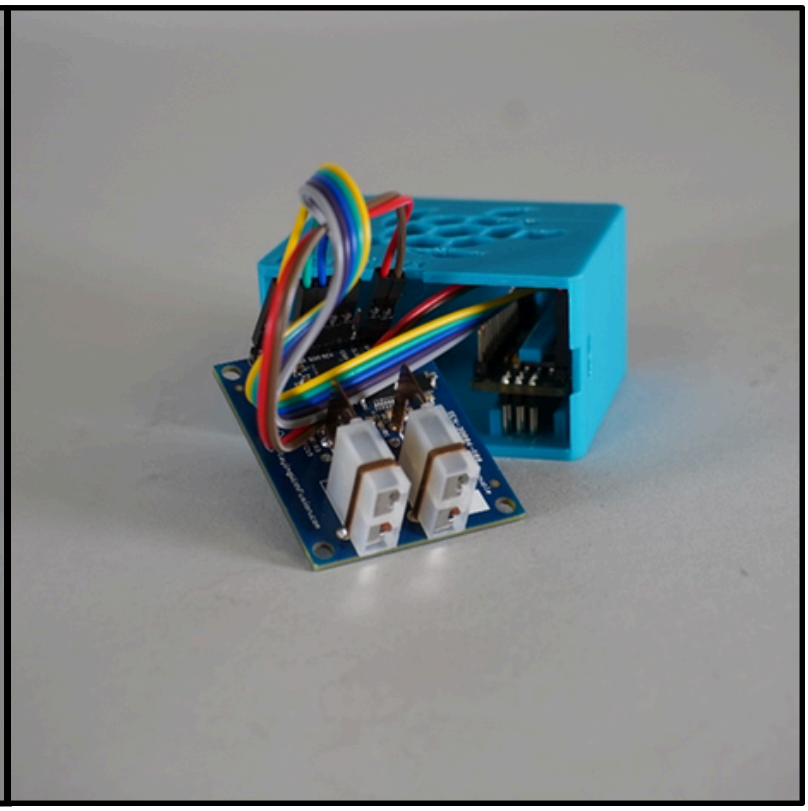
Assembly Continued

Step 2: Orientate the Arduino inside of the case

Slide the Arduino Nano into the right side of the case. The USB port of the of the Arduino Nano should face the back of the case so that the port slides into the small hole in the back of the case.



Before

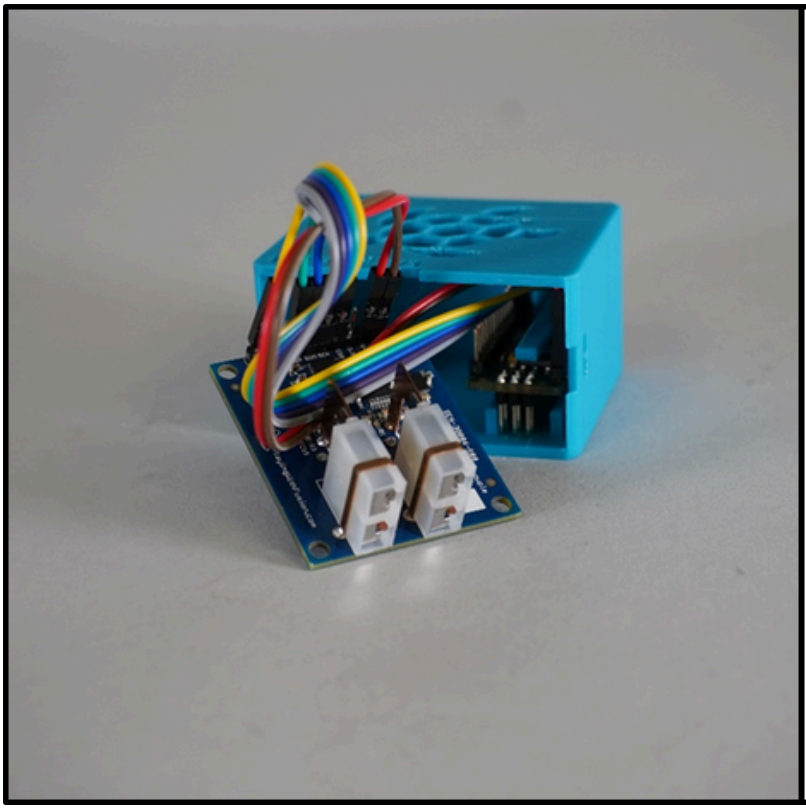


After

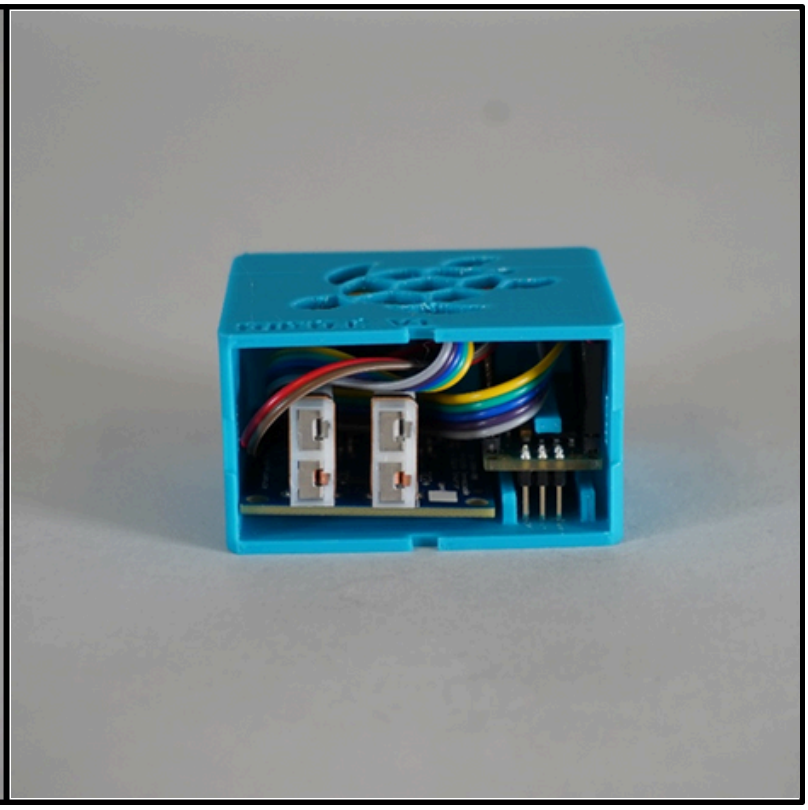
Assembly Continued

Step 3: Orientate the thermocouple board(MAX31856) inside of the case

Orientate the wires into the open area of the thermocouple board. With the wires tucked away, slide the thermocouple board into the case with the connectors facing out.



Before

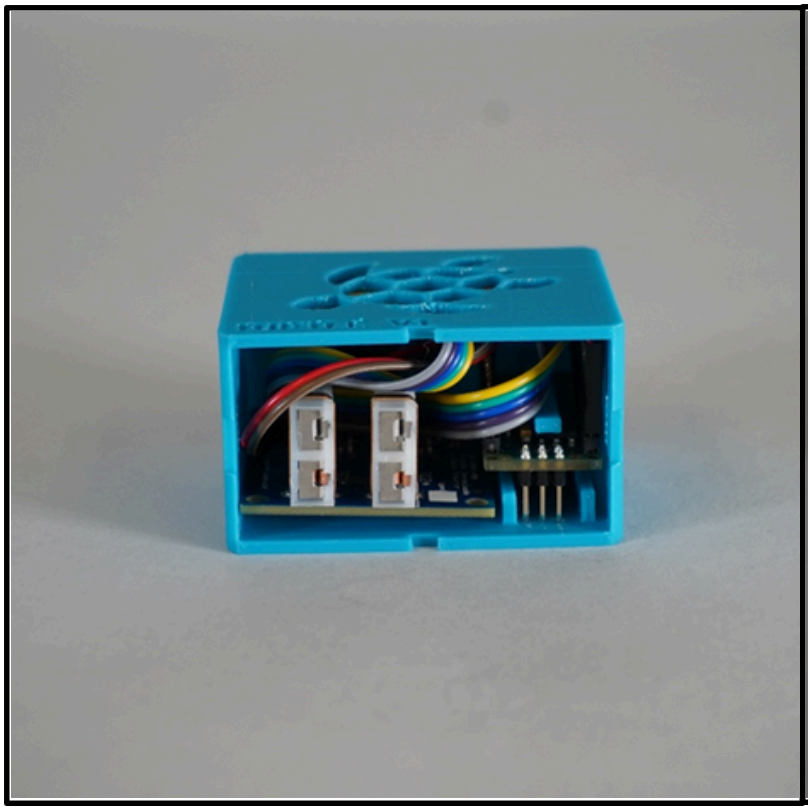


After

Assembly Continued

Step 4: Snap on cover

Snap the cover onto the case with the symbols “T1” and “T2” facing up.



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/v3.5

From there download:

1. **TURTLE_AppV3.5.zip**
2. **Source code(zip)**

Extract both folders

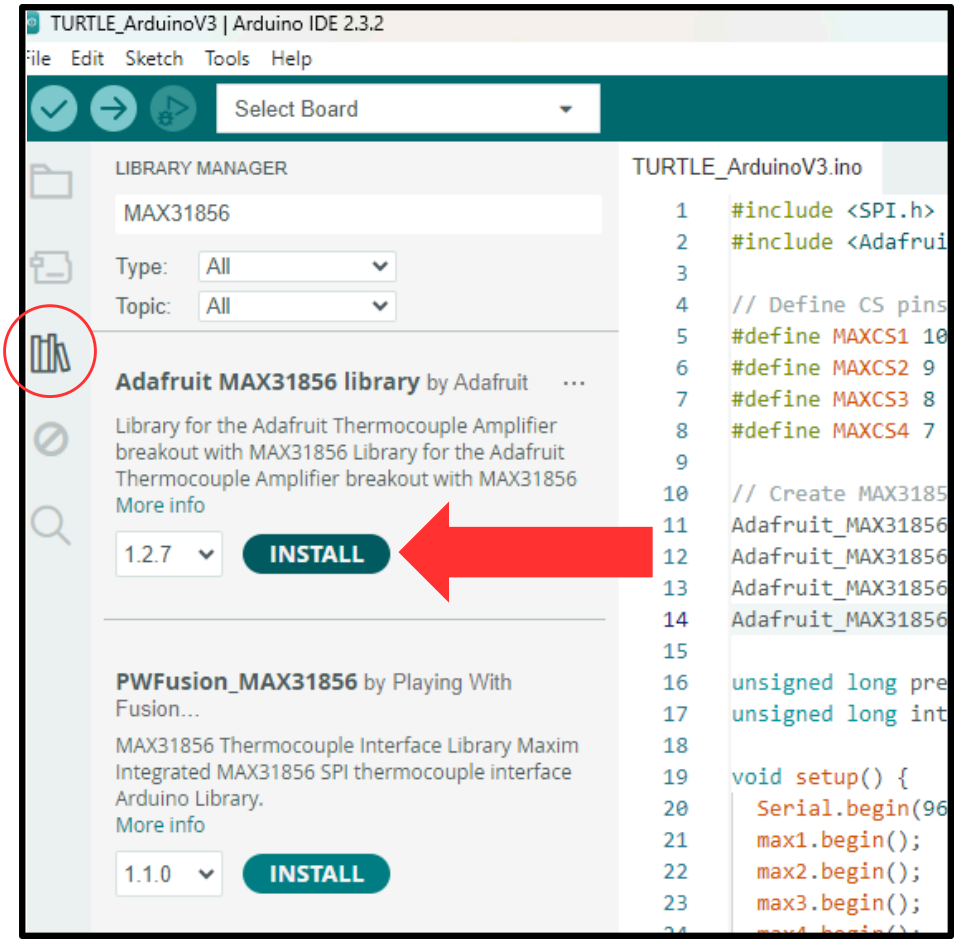
Step 3: Open Arduino Code

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 title “Adafruit MAX31856 library”.

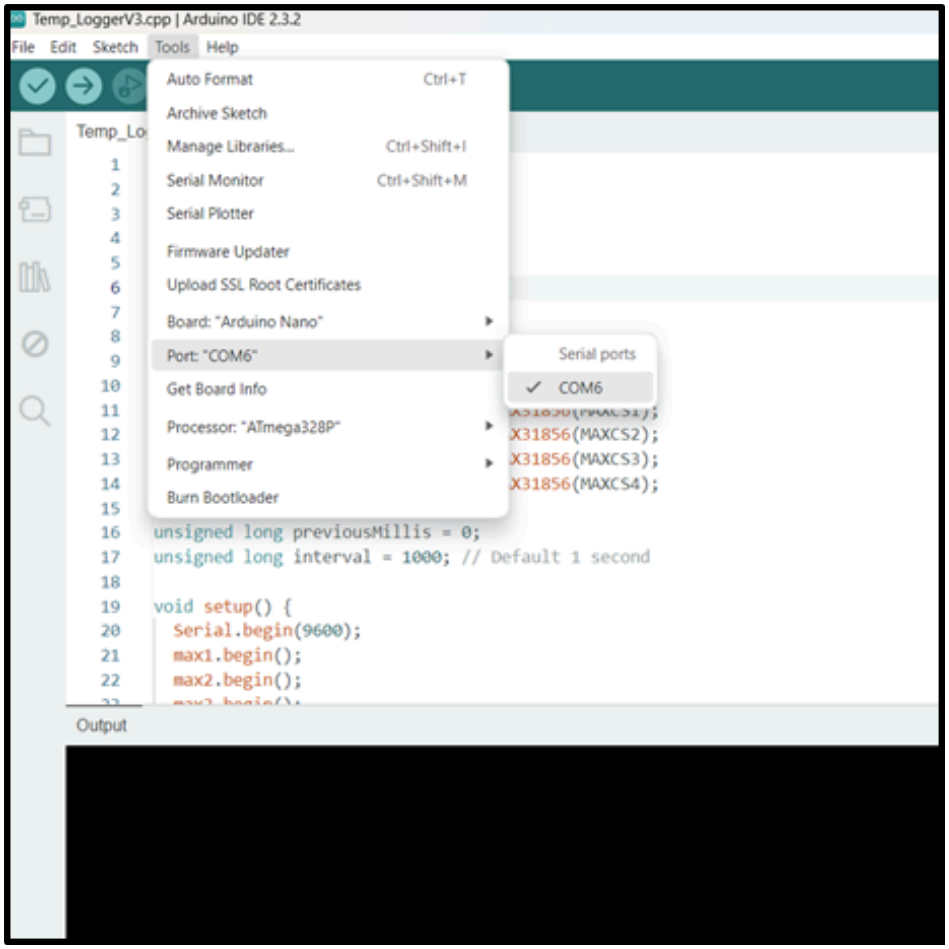


Uploading Arduino Code

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.

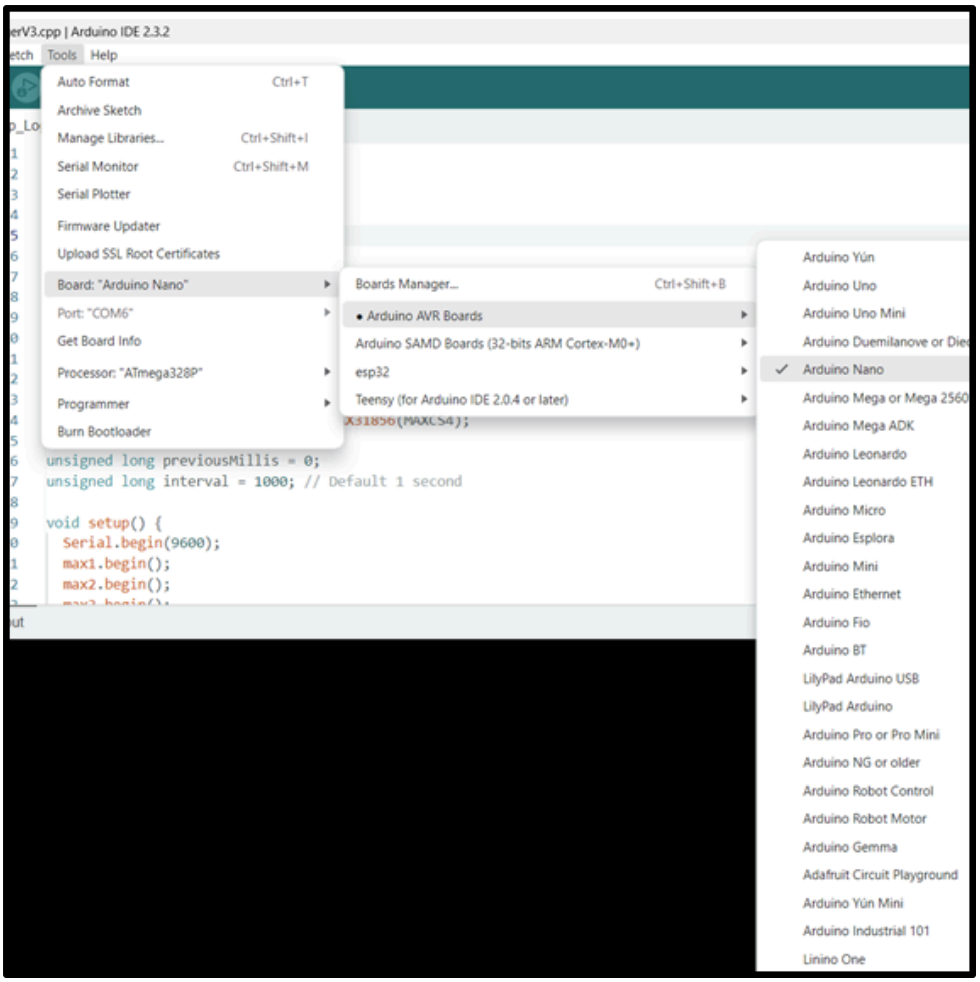
*__Note__: Multiple ports may appear (from mice, keyboards, etc.)



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”

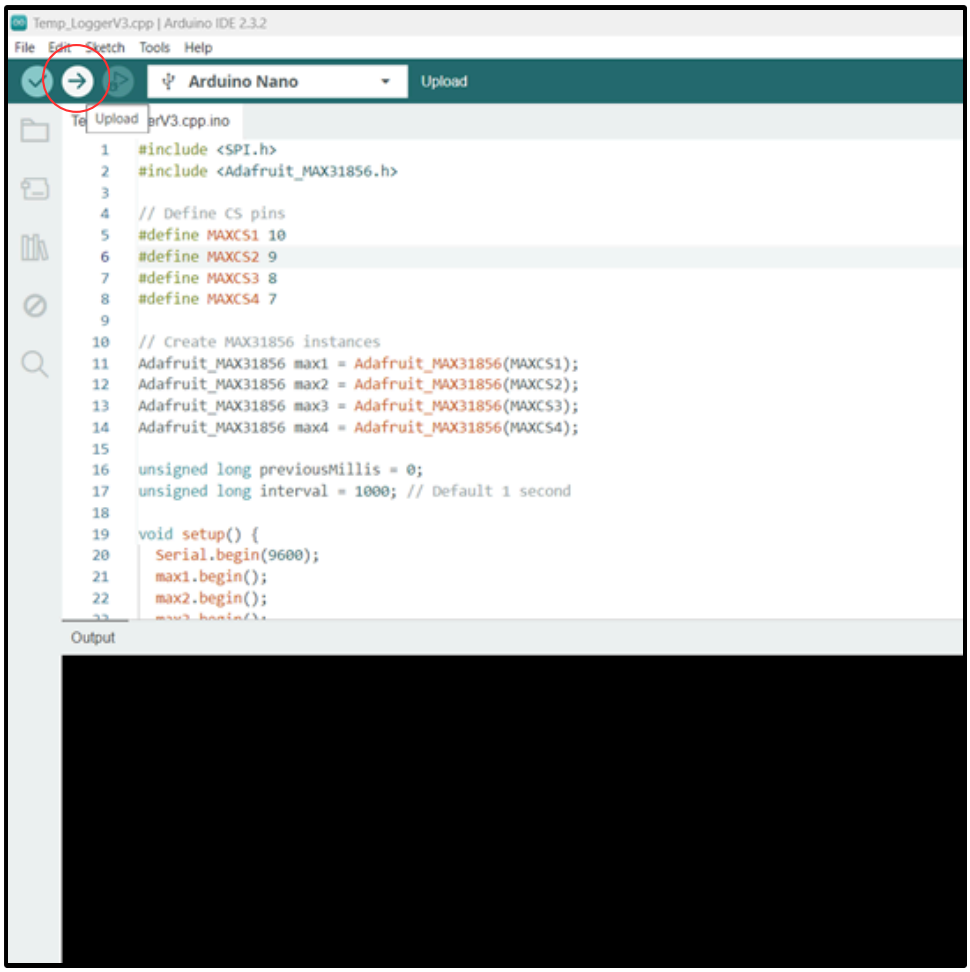


Uploading Arduino Code

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

Step 1: Download Files(if not already completed)

Navigate to the GitHub:
https://github.com/Colebrumfield/TURTLE-Device/releases/tag/v3.5

From there download:

1. **TURTLE_AppV3.5.zip**
2. **Source code(zip)**

Extract both folders

Step 2: Downloading 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: Running 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.**

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

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.