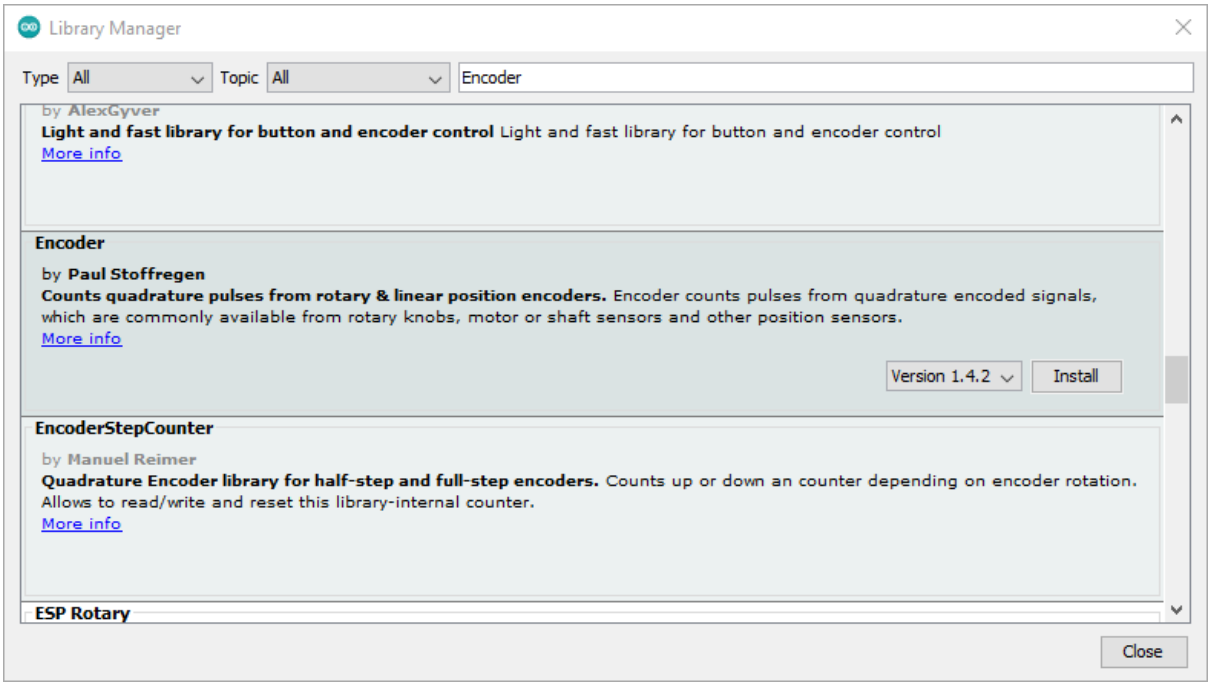
nxEncoder Filament encoder firmware and provisioning instructions
V1.0 by Simon Davie
https://github.com/nexx/nxencoder-util

Flashing the firmware

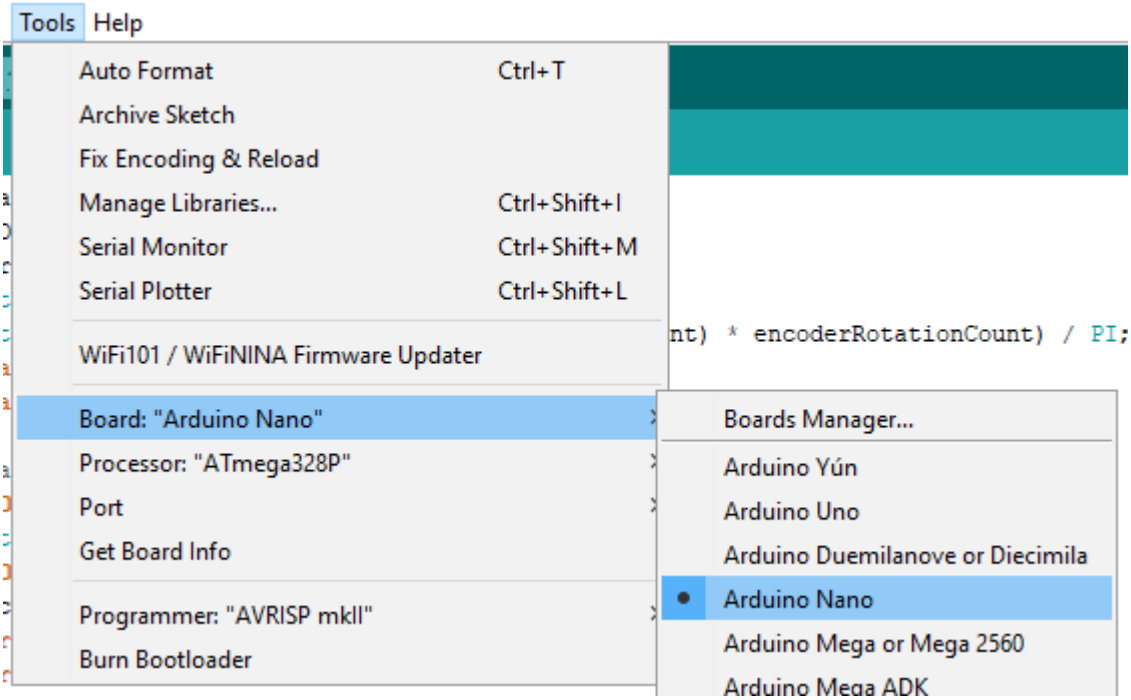
Step one:
Connect the Ardunio Nano to your computer via USB and then open the Arduino IDE. From the top menu, select **File** and then **Open**. Navigate to the folder containing firmware.ino and open the sketch in the IDE.

Step two:
From the top menu, select **Sketch**, **Include Library**, and lastly **Manage Libraries**. In the window that appears, type “Encoder” in the search box (top right), then scroll down until you find the Encoder library as shown:



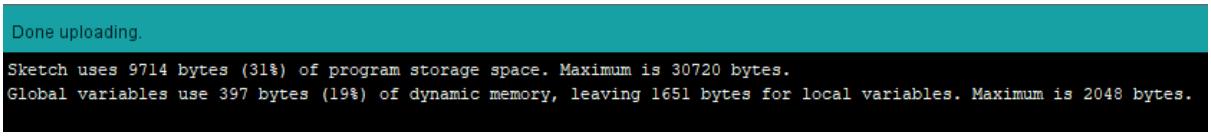
Click the option to install, and click close once it has completed.

Step three:
From the top menu, select **Tools**, **Board**, and then click **Arduino Nano**.



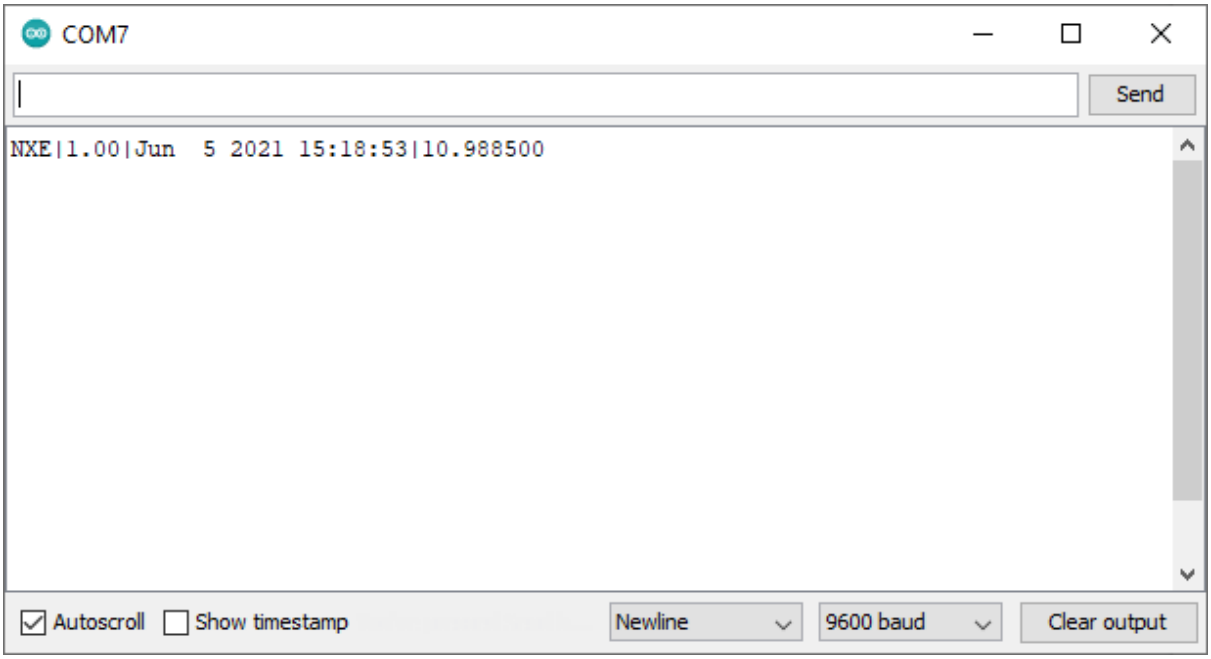
Step four:
From the top menu, select **Tools**, **Port**, and then select the serial port for the Arduino Nano. Normally there will be only a single port listed, but you may have to research which port the Nano is connected to if you have multiple in the list.

Step five:
From the top menu, select **Sketch** and then **Upload**. The Ardunio IDE will compile the firmware and then upload it to the Arduino Nano. If the status window at the bottom reports "**Done Uploading**", then you have successfully installed the firmware.



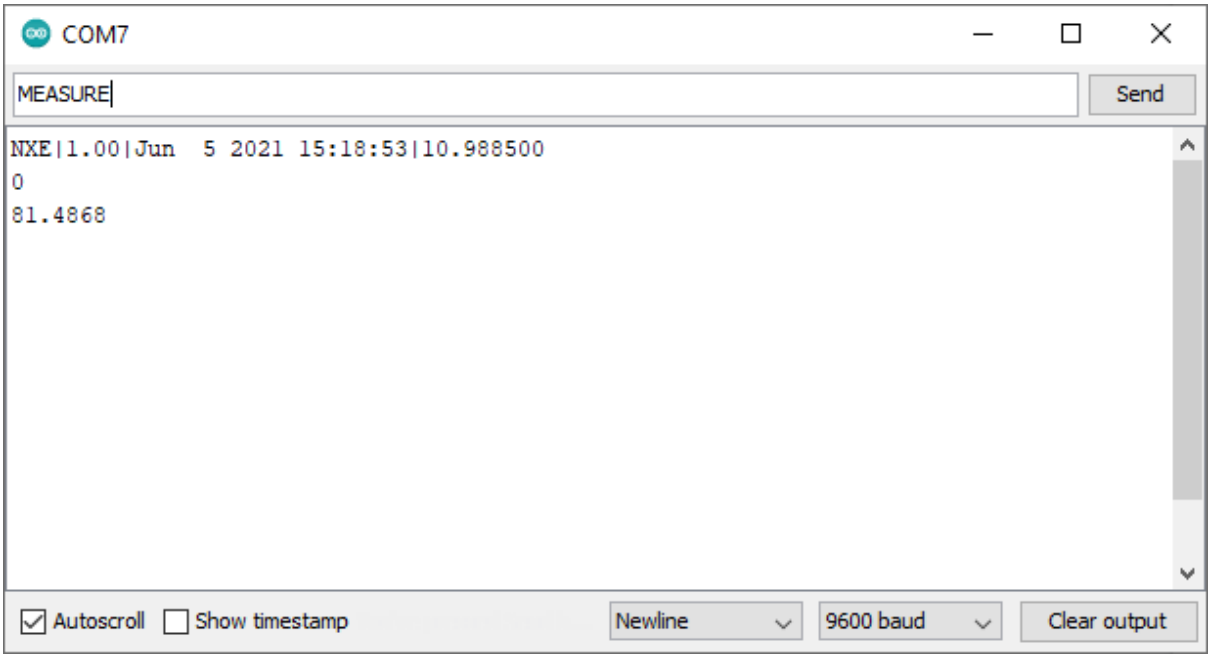
Step six:
From the top menu, select **Tools**, and then **Serial Monitor**. A new window will open. In the bottom right corner, select "**9600 baud**" in the drop-down next to the "**Clear Output**" button.

If all is well, you should see a line, similar to the one illustrated, appear in the console.



Step seven:
To test that the encoder is correctly wired to the Arduino Nano, type the command "**MEASURE**" in the top of the console window and then click **Send**. A new line should appear in the console, reporting 0.

Lastly, pull some filament through the encoder assembly, exiting through the length of PTFE tube. Issue the "**MEASURE**" command and make sure the distance reported has increased.

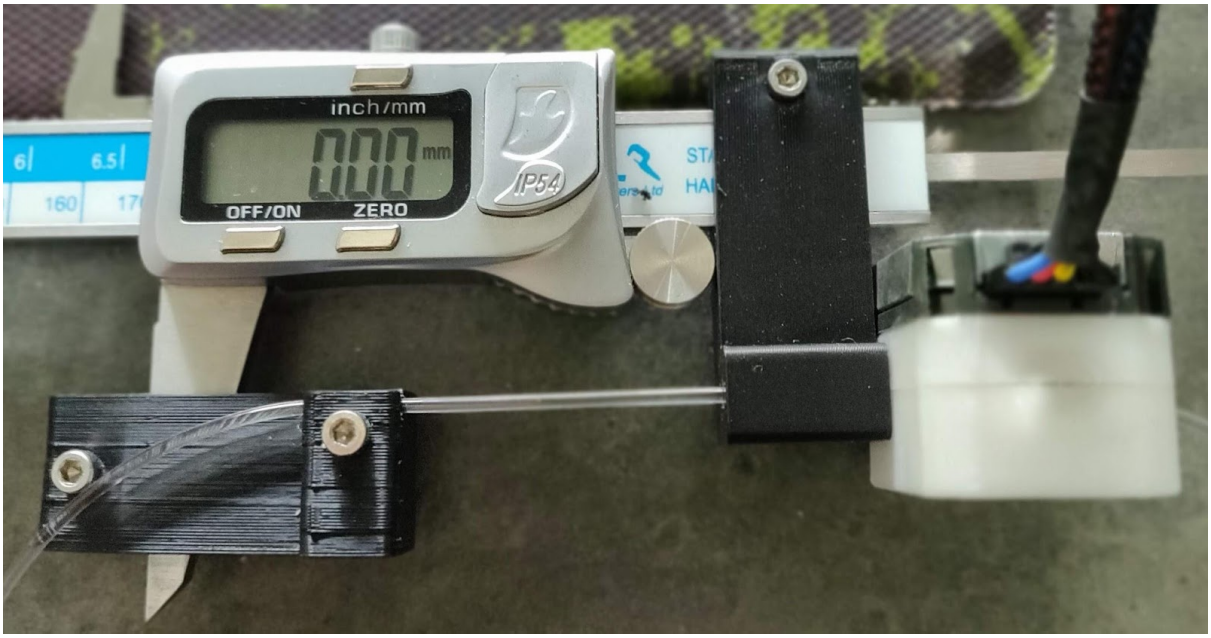


Calibration (optional but recommended)

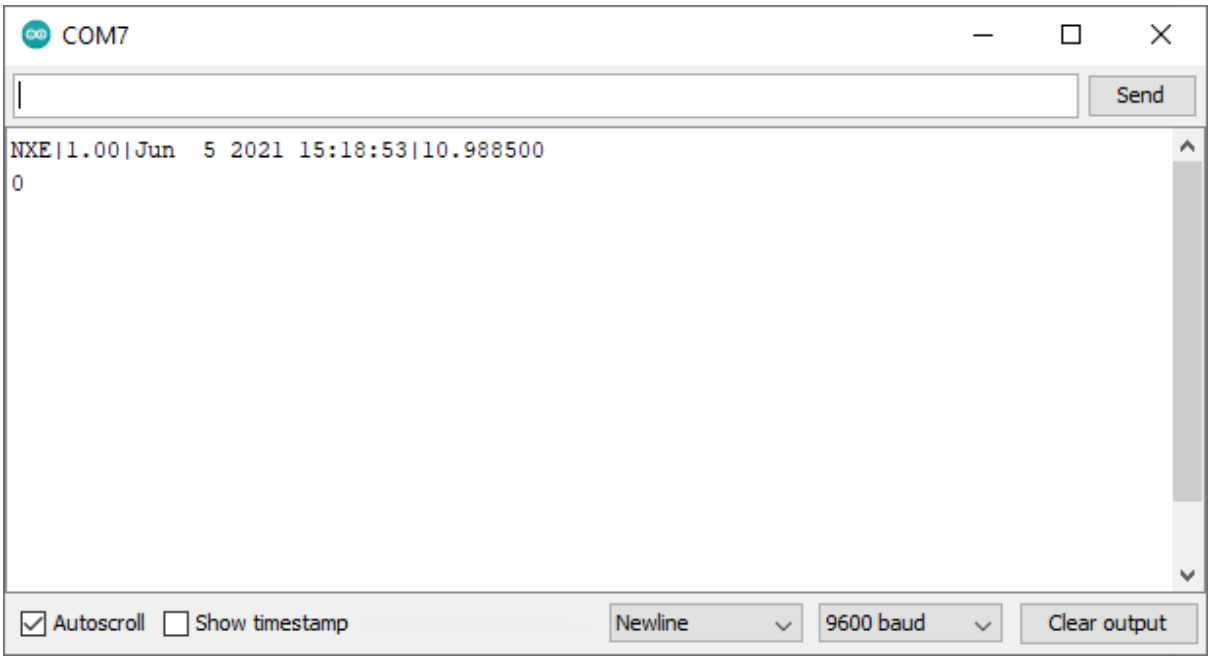
The diameter of the MK8 extruder gear can vary slightly from one gear to another. Calibration overcomes this difference and is achieved by pulling a known distance of filament through the encoder and reporting that measurement to the firmware. The firmware will calculate the diameter of your MK8 gear and store it in the Arduino Nano EEPROM.It is recommended to use a pair of vernier calipers, along with the printed jig, to measure the filament. Such as the tool by pkemp found here: https://www.thingiverse.com/thing:2249786

Step one:
Assemble the printed jig (linked above) and the encoder as shown below. Cut a length of filament and install it as well.

Step two:
Pull the length of filament through the encoder so that the calipers are fully extended as shown. Zero the calipers at this point.

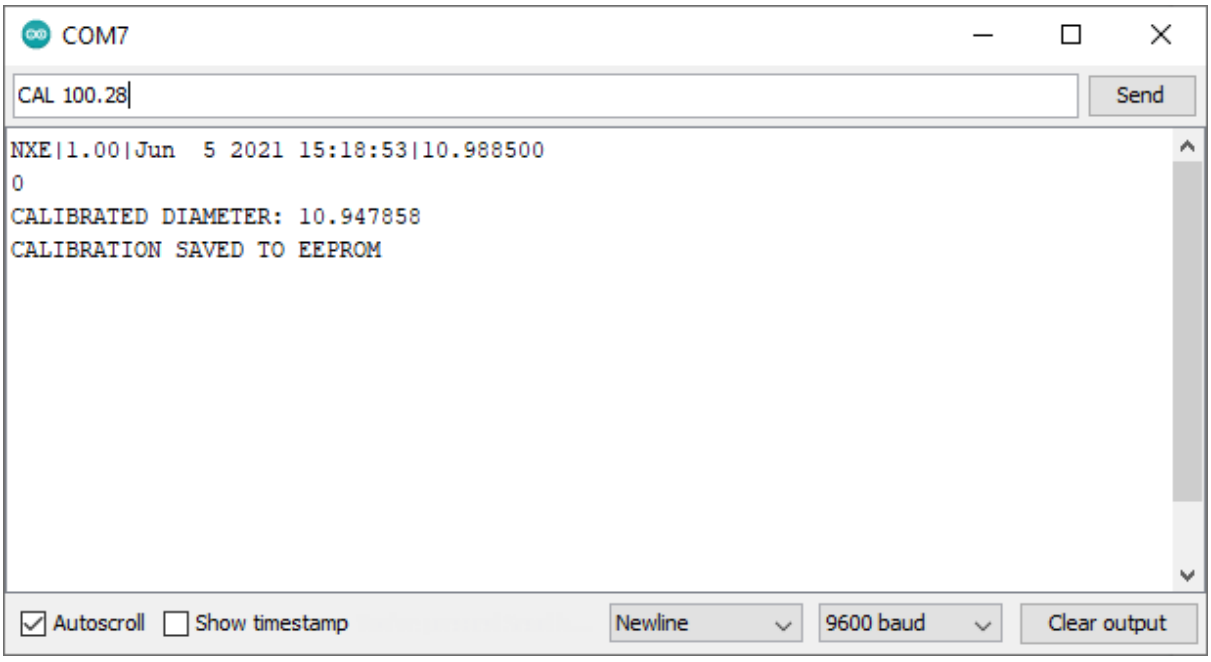


Step three:
Connect to the **Serial Monitor** of the Arduino Nano as detailed in **step six** above. Issue the "**MEASURE**" command and make sure it returns 0. If it returns any other value, issue the "**RESET**" command**.**



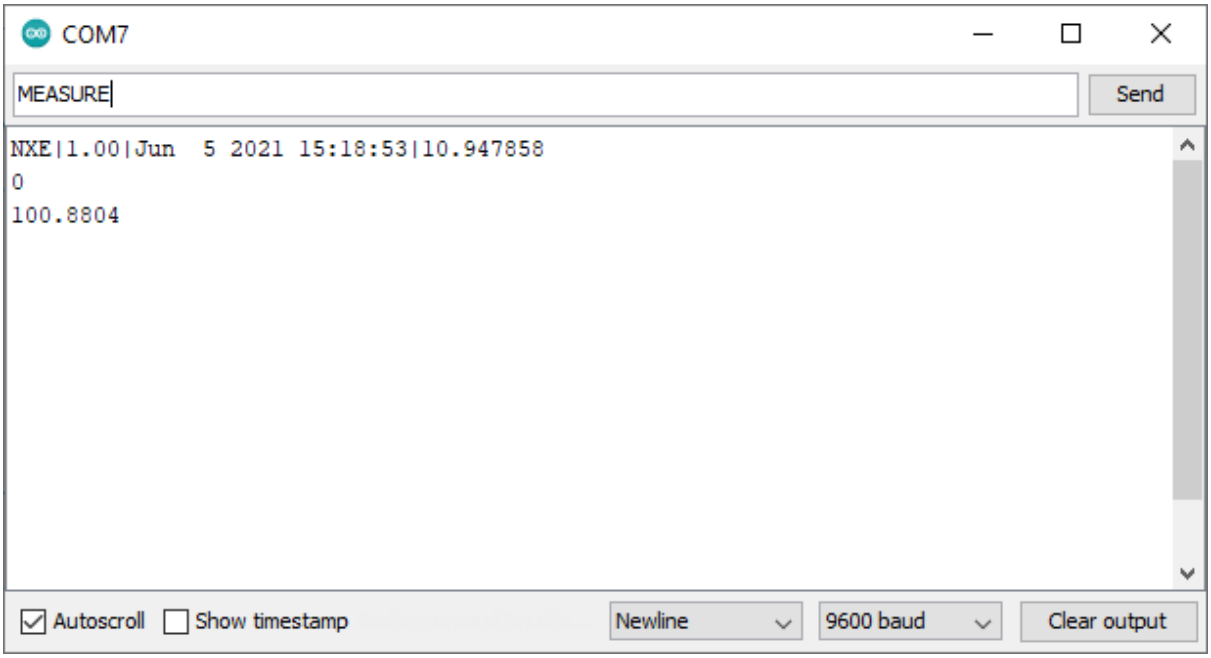
Step four:
Close the calipers slowly and stop at any distance. Calibrations over 100mm result in higher accuracy. Here you can see my measurement of 100.28mm.

Step five:
In the serial monitor, issue the "**CAL**" command followed by the measurement. In this example we use 100.28 as this was the reading from our measurement. The firmware will perform the necessary calculations and report the calibrated drive gear diameter as shown:



The calibrated value is stored internally on the Arduino. On power up, the value is retrieved and used, meaning calibration is normally a "one and done" event. If you suspect your encoder is reporting incorrect values, you can repeat the calibration at any time.

Step six:
We will now verify our calibration. First, repeat steps two, three and four. After this is done, issue the "**MEASURE**" command in the **Serial Monitor**. The reported value should be very close to the distance measured using the calipers. A difference of 0.1mm is acceptable.



Congratulations! Your encoder is now calibrated and ready to use.