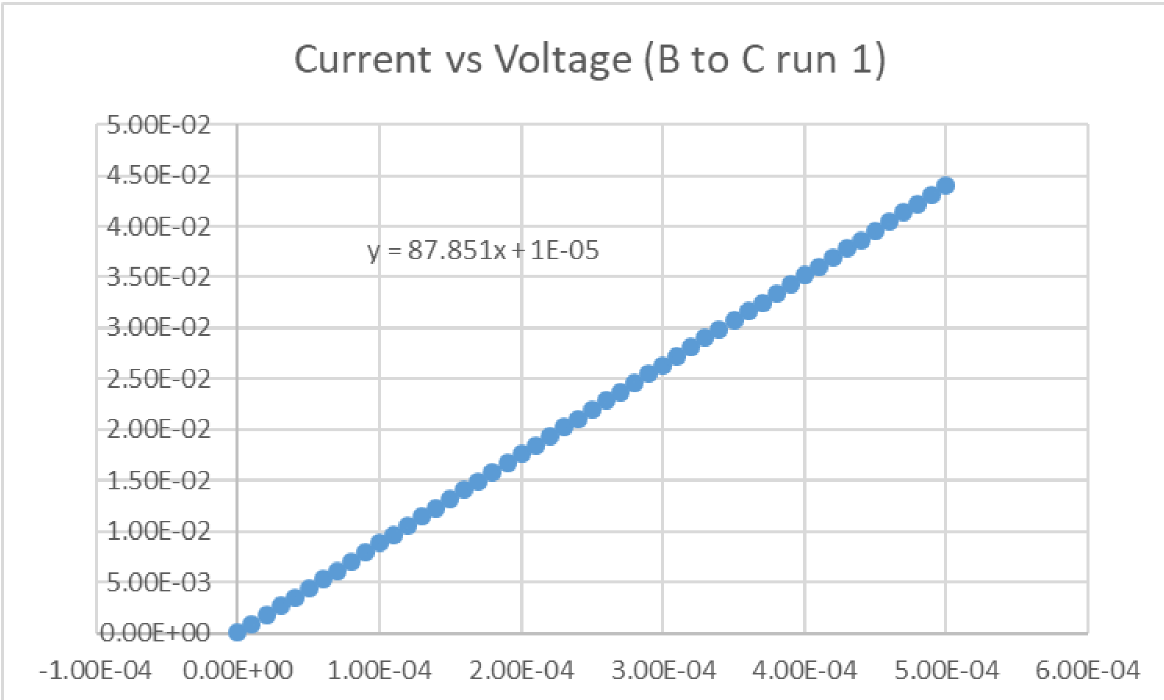
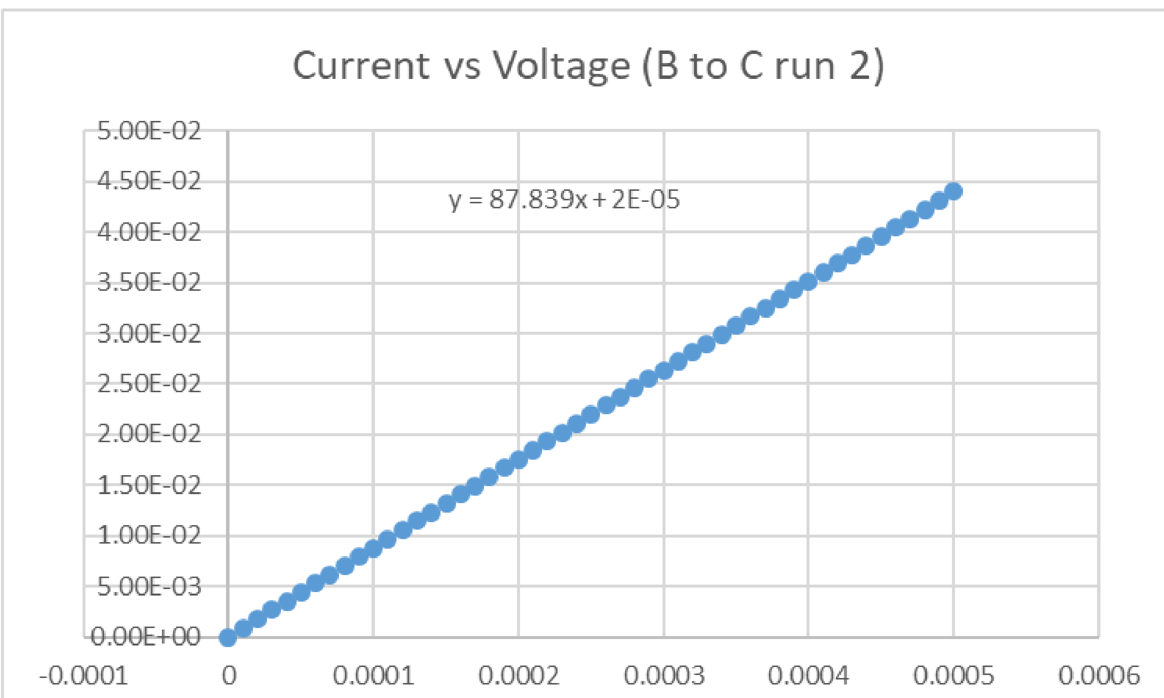
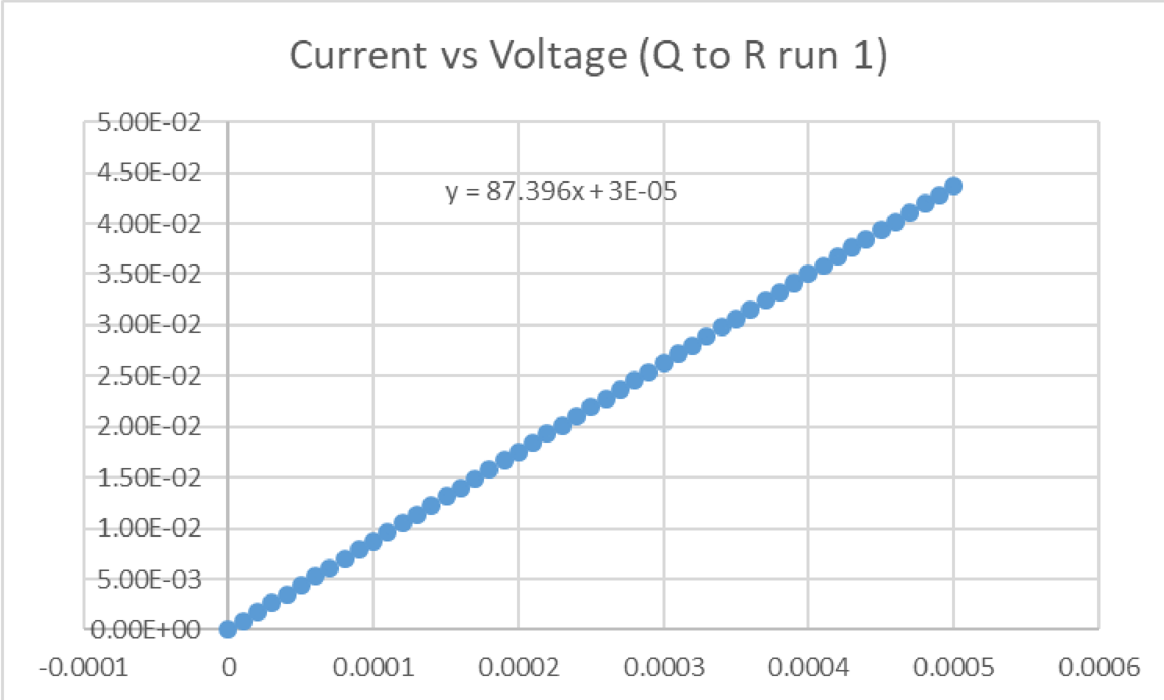
Calculating Resistance

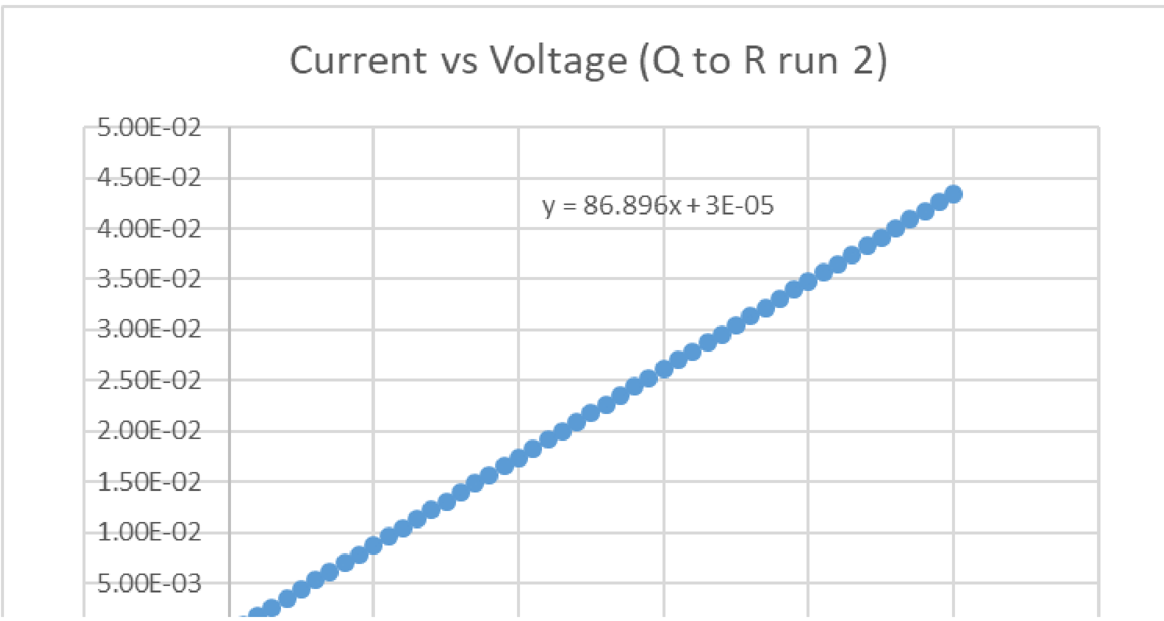
Taking the data for the current (x-axis) and the voltage (y-axis) without a magnetic field present, we can see that there is a linear relationship. From Ohm's law, the slope of the resistace is the resistance.

$$\text{Ohm's Law:} \quad V = IR$$









In [6]:

```
import numpy as np

# average of the resistances from all four runs with uncertainties
x = 86.896 + 87.396 + 87.839 + 87.851
dx = 1e-5 + 2e-5 + 3e-5 + 3e-5
print('Average resistance = ', x/4, '+/-', dx/4)
```

```
Average resistance =  87.49549999999999 +/- 2.25e-05
```

In [14]:

```
# thickness
R1 = 87.49549999999999 - 2.25e-05
R2 = 87.49549999999999
R3 = 87.49549999999999 + 2.25e-05
t = 500e-6 #m
w = 0.3 * 1/100 #cm
l = 1.8 * 1/100 #cm

# rho = A*R / l (formula for resistivity from resistance)
rho1 = w*t*R1 / l
rho2 = w*t*R2 / l
rho3 = w*t*R3 / l

print('Low resistivity: ', rho1)
print('Middle resistivity: ', rho2)
print('Upper resistivity: ', rho3)
print()
print('Resistivity is equal to ', rho2, '(Ohm meters)', '+/-', rho3-rho2,
```

```
Low resistivity:  0.007291289791666666
Middle resistivity:  0.0072912916666666655
Upper resistivity:  0.007291293541666665

Resistivity is equal to  0.0072912916666666655 (Ohm meters) +/- 1.874999
9998804445e-09 (Ohm meters)
```

In [ ]:

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