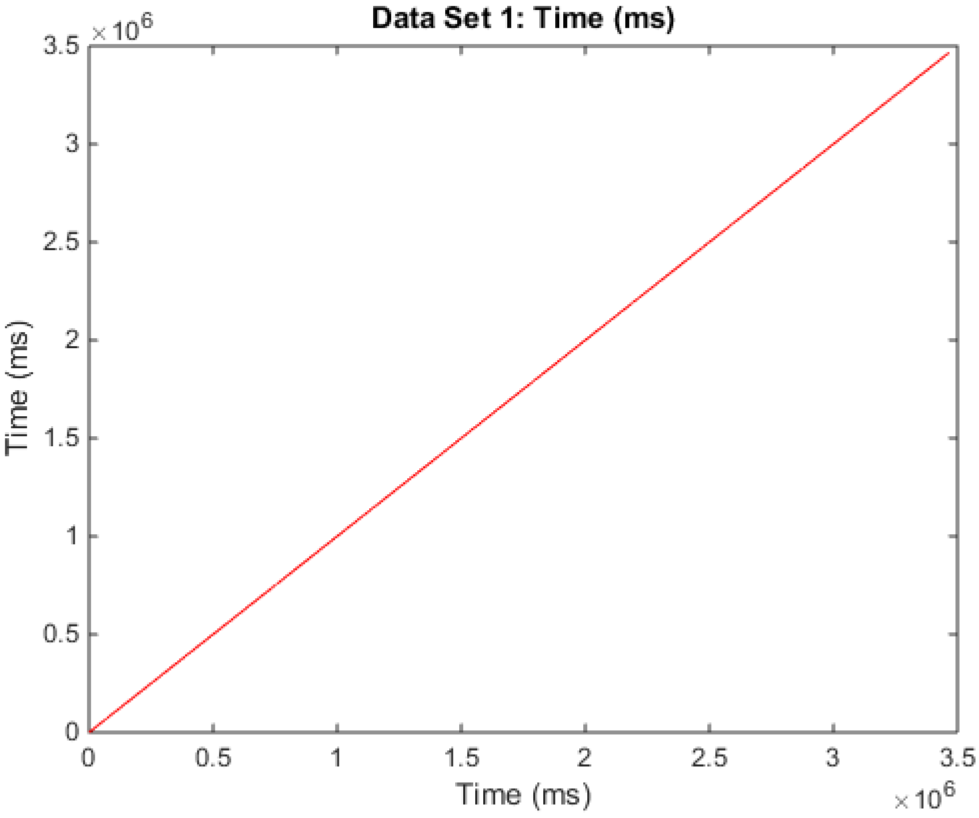
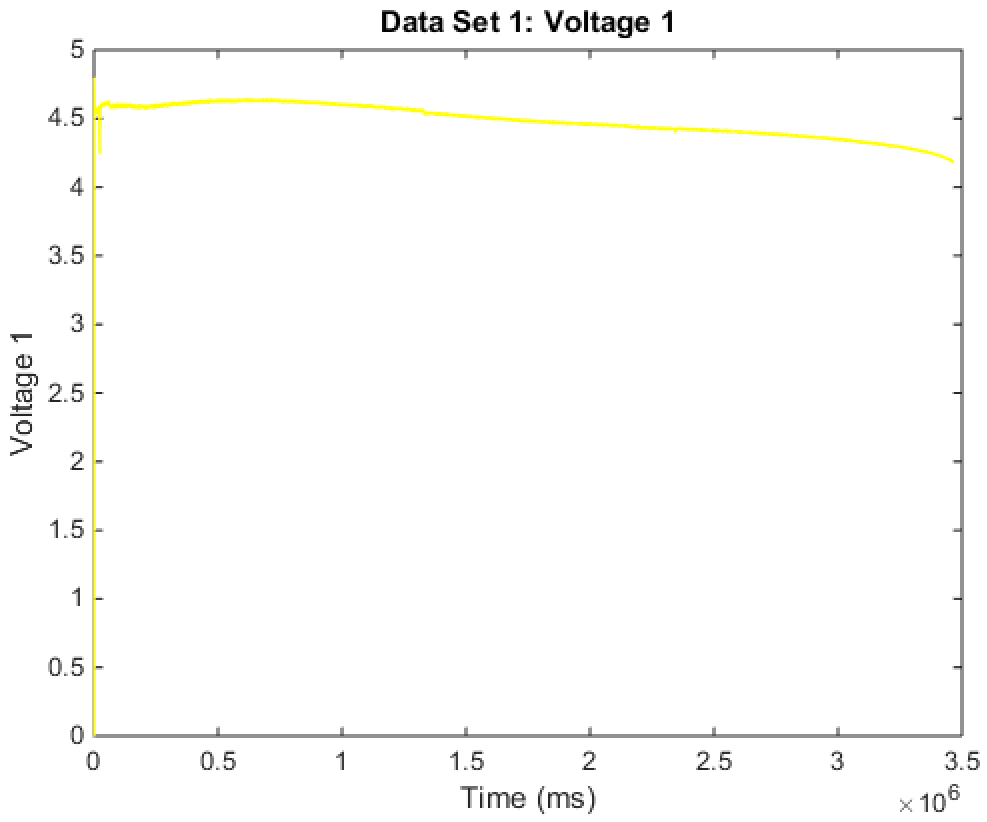
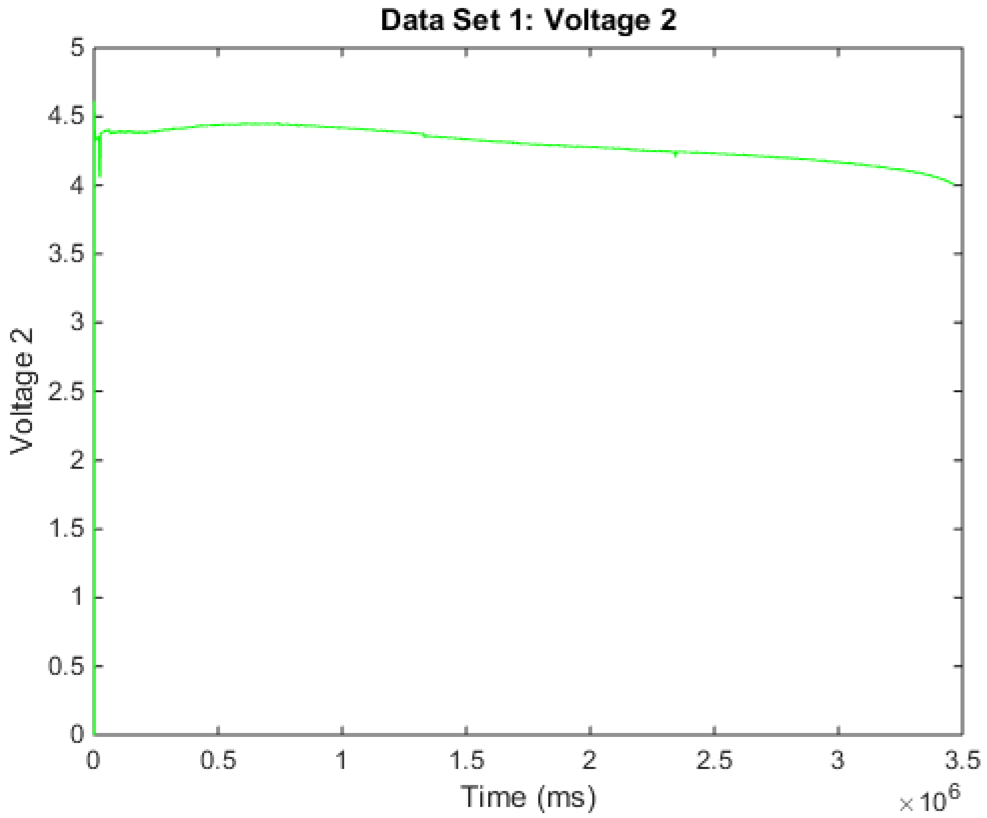
Plotting Experimental Data Set

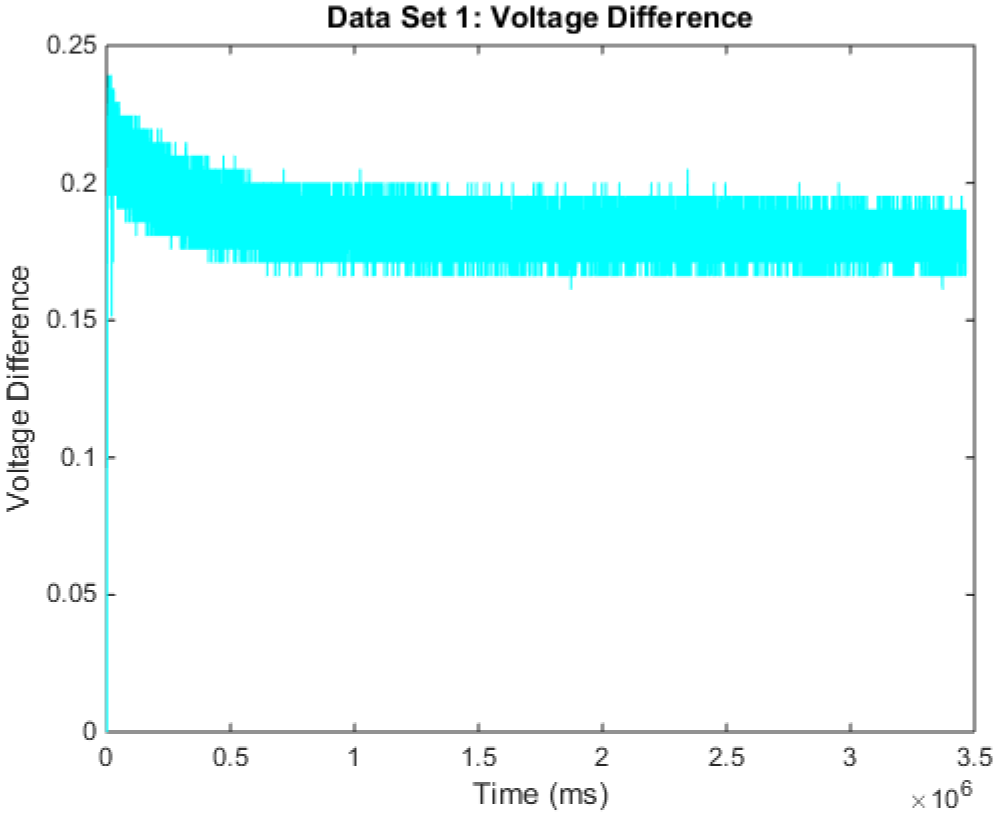
```
%close all;
clear all;
clc;
fig = 0;

shunt_r = 0.1598; %ohms

files = {'data_take2.csv'}; %or {} or {file0.csv, file1.csv... etc.}
files = {};
if length(files) <= 0
    files = uigetfile('*.csv','Select Data Set(s)','MultiSelect','on');
end
if ~iscell(files) %force into iterable, if only 1 input file.
    files = {files};
end

for i = 1:length(files)

    col_data   = csvread(files{i}, 1);
    plot_until_index = col_data(:,2) - col_data(:,3);
    thresh = 50;
    plot_until_index = find(plot_until_index > thresh, 1);
    plot_until_index = plot_until_index - 1;
    time_mills = col_data(1:plot_until_index,1);
    ms_dies = time_mills(plot_until_index);
    min_dies = ms_dies ./(1000 .* 60);
    fprintf('\nBattery Dies after %.3f minute(s).\n', min_dies);
    titles = {'Time (ms)'; ...
        'Voltage 1'; 'Voltage 2'; 'Voltage Difference'; 'Current'; 'Power'};
    time_mills = col_data(1:plot_until_index,1);
    clear data;
    total_plots = min(size(col_data));
    total_plots = max(total_plots, 6);
    colors = hsv(total_plots);
    for j = 1:total_plots;

        if j <= length(titles)
            data{j}.title = titles{j};
        else
            data{j}.title = sprintf('Input %.0d', j);
        end
        %data{j}.title = sprintf('Input %.0d', j);
        if j <= min(size(col_data))
            data{j}.y     = col_data(1:plot_until_index,j);
        end
        if (j > 1) .* (j<4)
            data{j}.y = 5.0 .* data{j}.y ./ 1024.0;
        end
        if j == 4
            data{j}.y = data{2}.y - data{3}.y;
```

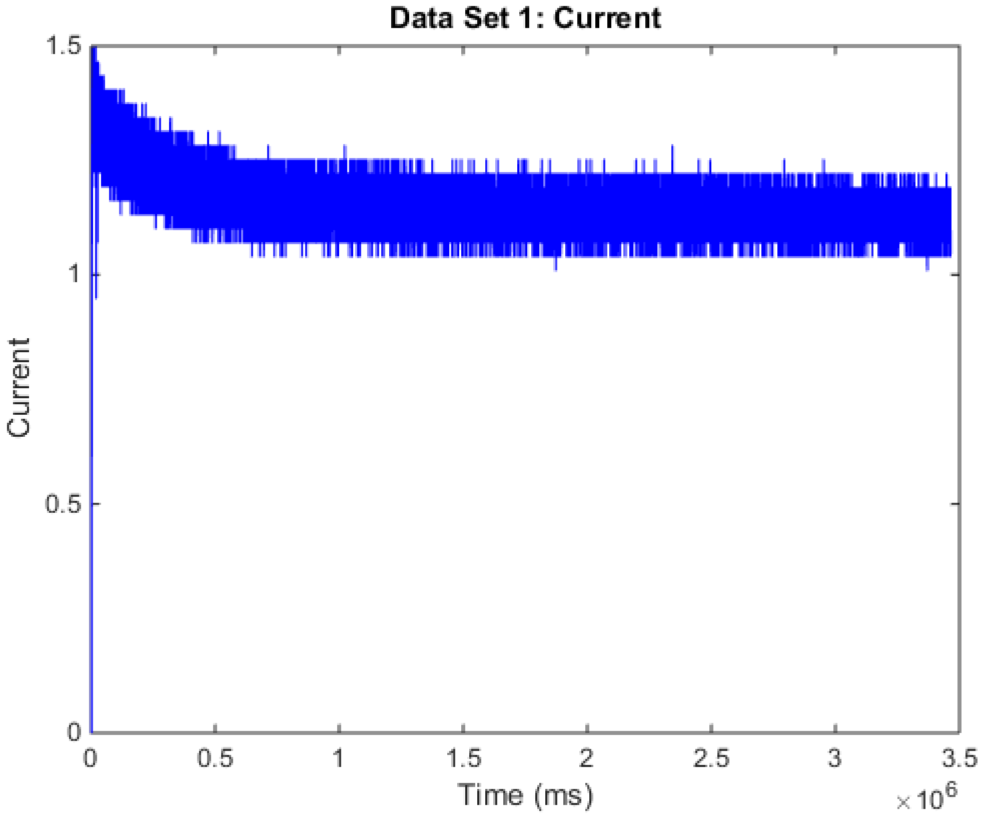
```
end
if j == 5
    data{j}.y = data{4}.y ./ shunt_r;
end
if j == 6
    data{j}.y = data{2}.y .* data{5}.y;
end
data{j}.x     = time_mills;
% don't plot TIME vs TIME.
if j ~= 0 %usually 1, debug 0
    fig = fig+1;
    figure(fig);
    plot(  data{j}.x, data{j}.y, 'color', colors(j,:));
    ylabel( data{j}.title);
    xlabel(titles(1));
    title(sprintf('Data Set %.0d: %s', i, data{j}.title));
end
```

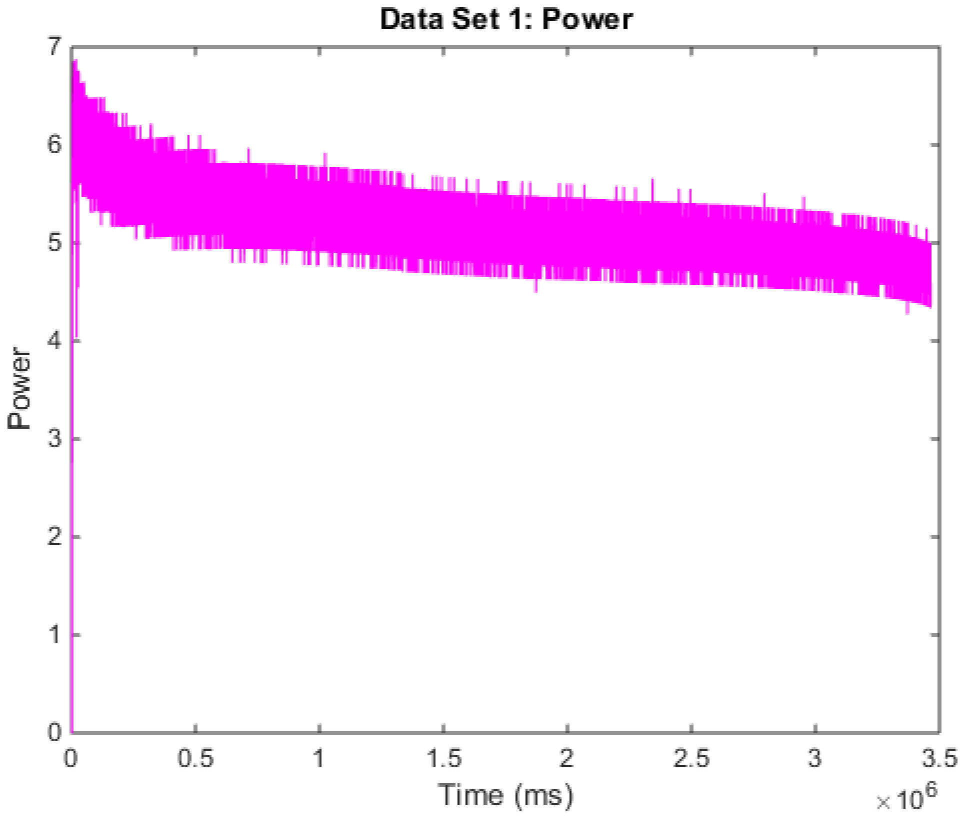



Data Set 1: Voltage 1
Voltage 1
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0
0.5
1
1.5
2
2.5
3
3.5
Time (ms)
$\times 10^6$


Data Set 1: Voltage 2
Voltage 2
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0
0.5
1
1.5
2
2.5
3
3.5
Time (ms)
$\times 10^6$


Data Set 1: Voltage Difference
Voltage Difference
0.25
0.2
0.15
0.1
0.05
0
0
0.5
1
1.5
2
2.5
3
3.5
Time (ms)
$\times 10^6$

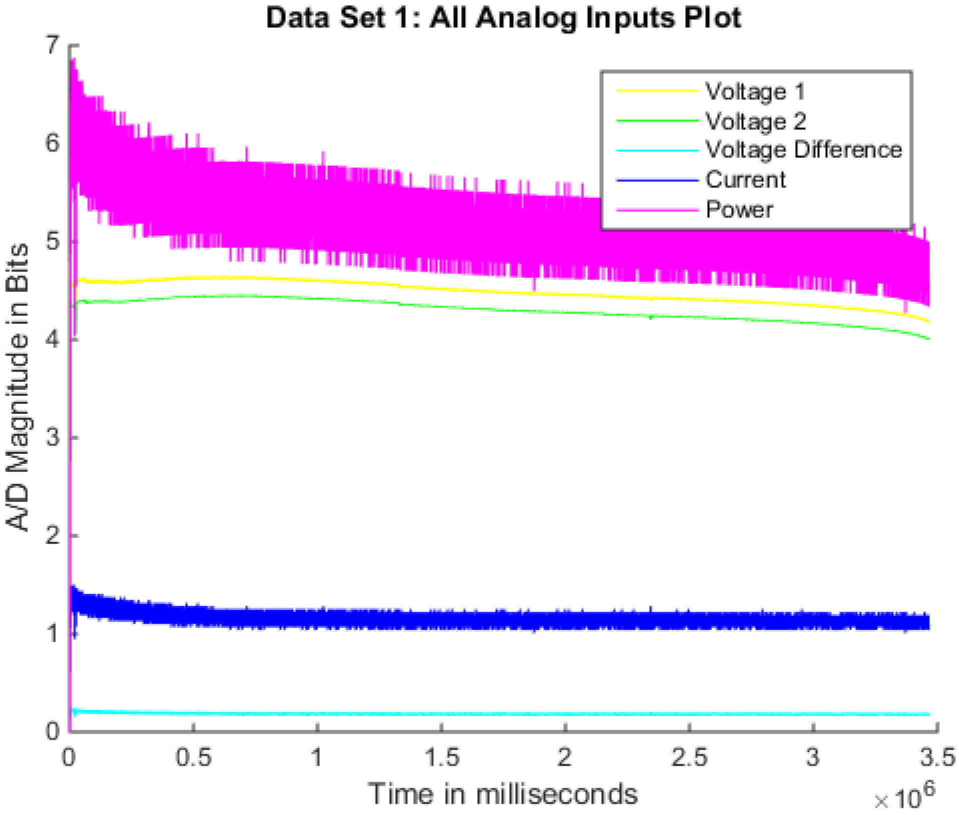

Data Set 1: Current
Current
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
Time (ms)
$\times 10^6$



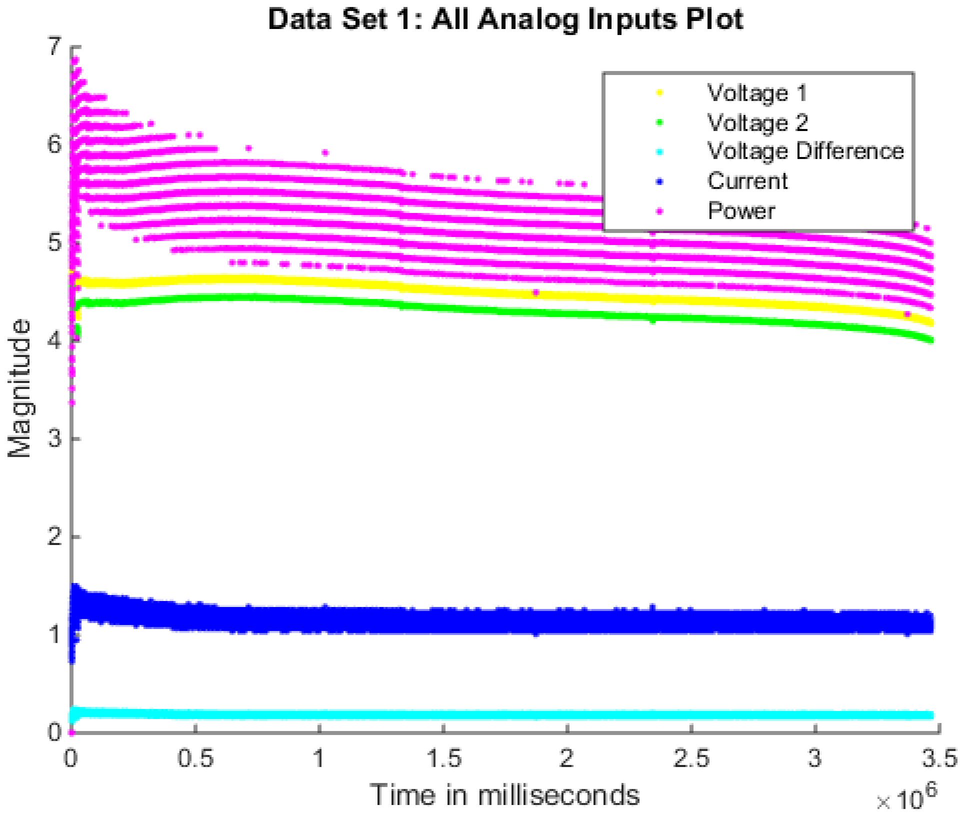
```
    end
```

Battery Dies after 57.751 minute(s).

```
    fig = fig+1;
    figure(fig);
    hold on;
    for j = 2:length(data)
        plot(data{j}.x, data{j}.y, 'Color', colors(j,:));
    end
    ylabel('A/D Magnitude in Bits'  );
    xlabel('Time in milliseconds'   );
    legend(titles(2:length(titles)) );
    title(sprintf('Data Set %.0d: %s', i, 'All Analog Inputs Plot') );
    hold off;
```



```
fig = fig+1;
figure(fig);
hold on;
for j = 2:length(data)
    plot(data{j}.x, data{j}.y, '.', 'Color', colors(j,:));
end
ylabel('Magnitude'  );
xlabel('Time in milliseconds'    );
legend(titles(2:length(titles)) );
title(sprintf('Data Set %.0d: %s', i, 'All Analog Inputs Plot') );
hold off;
```



```
    fit = polyfit(transpose(time_mills), 1:length(time_mills),1);
    avg_period = 1/fit(1);
    fprintf('\nData Set %s (%.0d) ', files{i}, i);
    fprintf('has an Average Sampling Rate of %.3f ', avg_period);
    fprintf('milliseconds.\n');
```

```
Data Set USB_Power_Bank_Drain_log.csv (1) has an Average Sampling Rate of 25.776 m
```

```
    fs_rate   = 1000/(avg_period); %ms to Hz
    N_samples = length(time_mills);
    f_axis    = linspace(-fs_rate/2,fs_rate/2,N_samples);

    if length(data) >= 6
        avg_power = mean(data{6}.y);
        fprintf('\nAverage Power Output: %.3f Watts.', avg_power);
        run_hour = time_mills(end);
        run_hour = run_hour ./(1000 .* 60 .* 60);
        fprintf('\nOver %.3f Hour(s).', run_hour);
        fprintf('\nYeilds %.3f Watt-Hours.\n', avg_power .* run_hour);
    end
```

```
Average Power Output: 5.175 Watts.
Over 0.963 Hour(s).
Yeilds 4.981 Watt-Hours.
```

```
end
```

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