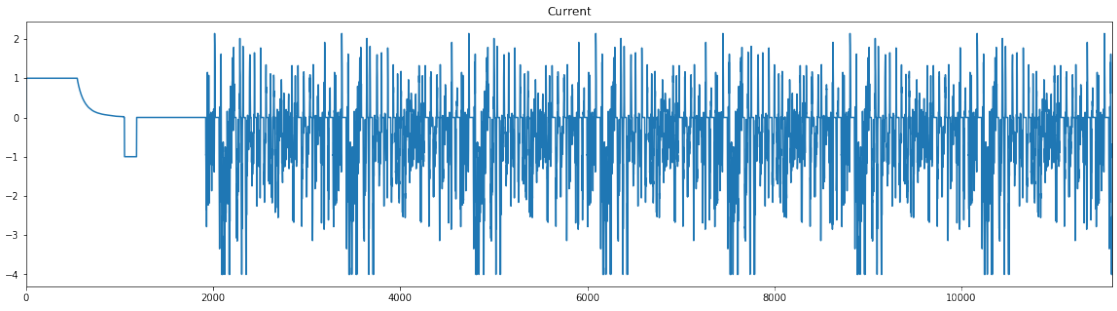
soc_fuds

April 19, 2018

In [1]:
```
%matplotlib inline
import matplotlib.pyplot as plt
import pandas as pd



file = r'../data/FUDS/SP2_0C_FUDS/02_25_2016_SP20-2_0C_FUDS_80SOC.xls'
xls = pd.ExcelFile(file)
df = pd.read_excel(xls, 'Channel_1-006')

# df = pd.read_excel(open(file,'rb'), sheet_name='Channel_1-006')


# get colum names
# print(list(df))

#
```

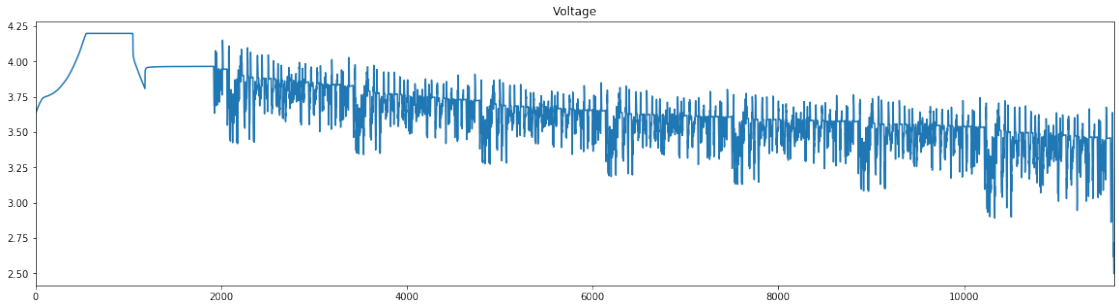
In [2]:
```
df['Current(A)'].plot(title='Current', figsize=(20, 5))
```

Out[2]: <matplotlib.axes._subplots.AxesSubplot at 0x7f60bd652290>



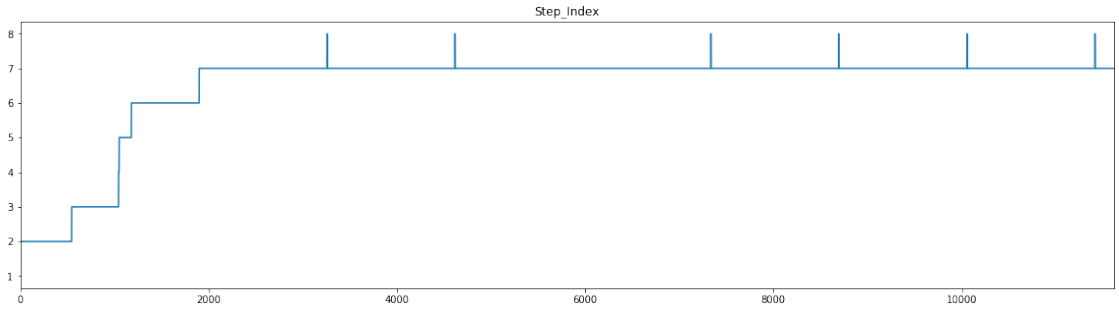
In [3]:
```
df['Voltage(V)'].plot(title='Voltage', figsize=(20, 5))
```

Out[3]: <matplotlib.axes._subplots.AxesSubplot at 0x7f60bd4beb10>



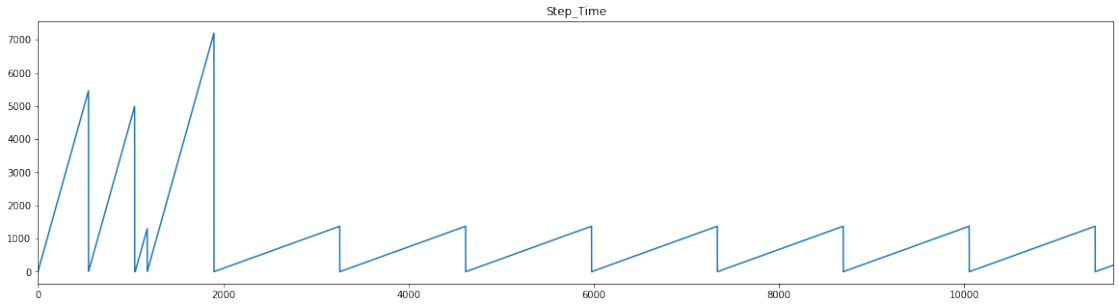

```
In [4]: df['Step_Index'].plot(title='Step_Index' , figsize=(20, 5))
```

```
Out[4]: <matplotlib.axes._subplots.AxesSubplot at 0x7f60bdb92890>
```



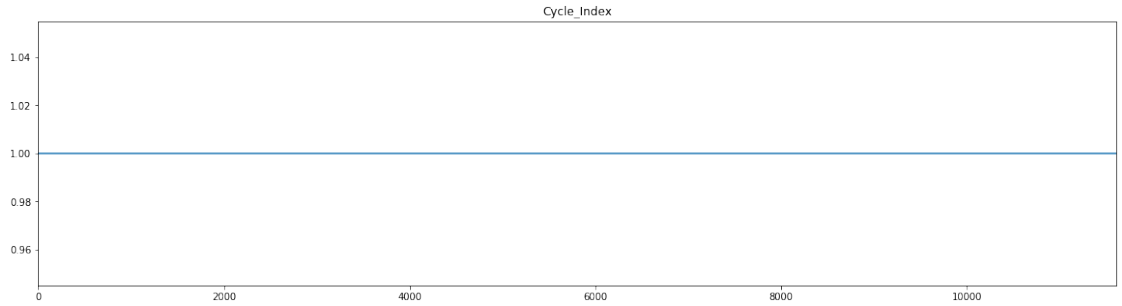

```
In [5]: df['Step_Time(s)'].plot(title='Step_Time' , figsize=(20, 5))
```

```
Out[5]: <matplotlib.axes._subplots.AxesSubplot at 0x7f60bd867950>
```



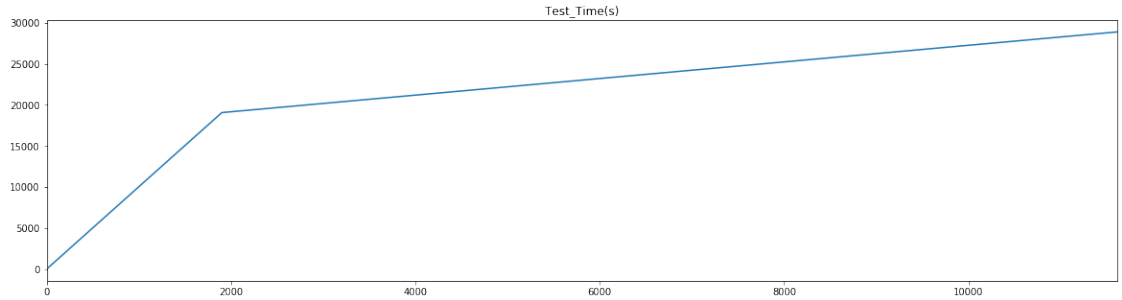

```
In [6]: df['Cycle_Index'].plot(title='Cycle_Index' , figsize=(20, 5))
```

```
Out[6]: <matplotlib.axes._subplots.AxesSubplot at 0x7f60bd6dfcd0>
```



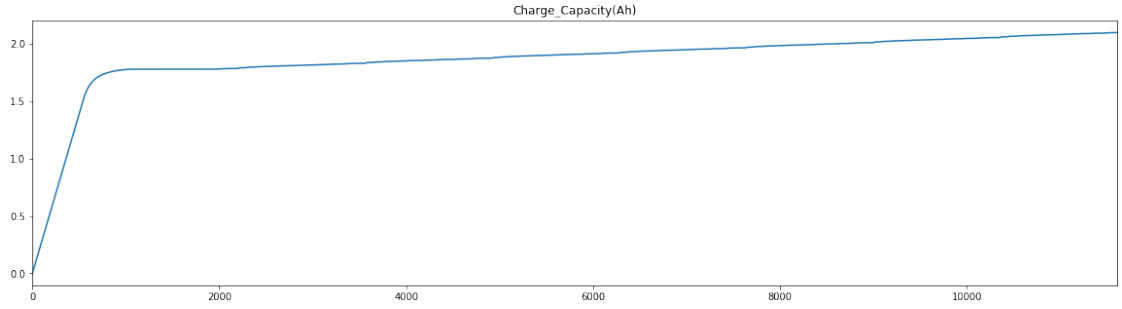
In [7]: df['Test_Time(s)'].plot(title='Test_Time(s)' , figsize=(20, 5))

Out[7]: <matplotlib.axes._subplots.AxesSubplot at 0x7f60bd57ef90>



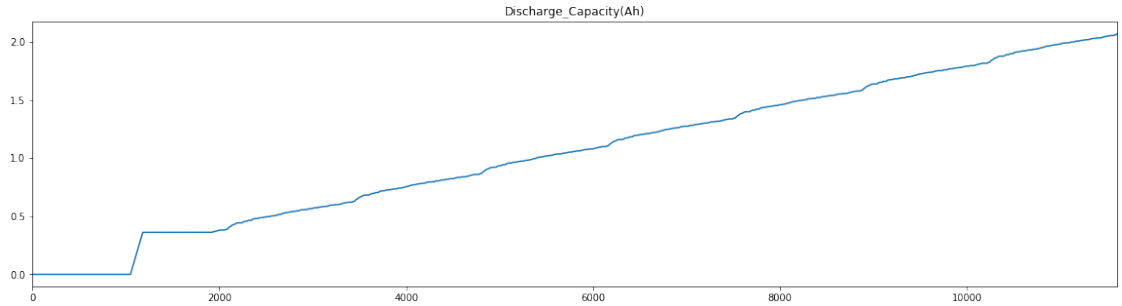
In [8]: df['Charge_Capacity(Ah)'].plot(title='Charge_Capacity(Ah)' , figsize=(20, 5))

Out[8]: <matplotlib.axes._subplots.AxesSubplot at 0x7f60b6423250>



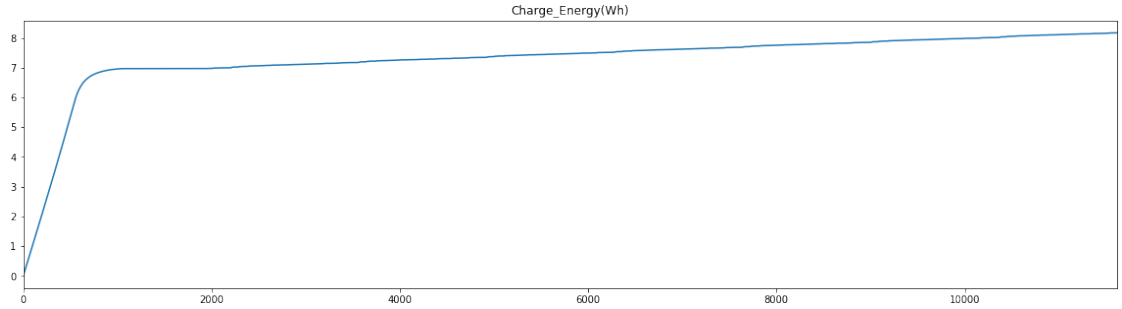
In [9]: df['Discharge_Capacity(Ah)'].plot(title='Discharge_Capacity(Ah)' , figsize=(20, 5))

Out[9]: <matplotlib.axes._subplots.AxesSubplot at 0x7f60b6379110>



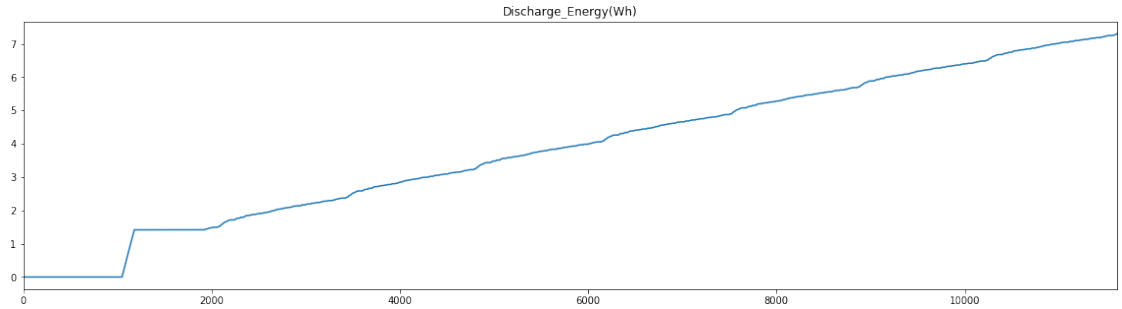

```
In [10]: df['Charge_Energy(Wh)'].plot(title='Charge_Energy(Wh)' , figsize=(20, 5))
```

```
Out[10]: <matplotlib.axes._subplots.AxesSubplot at 0x7f60b62dbfd0>
```




```
In [11]: df['Discharge_Energy(Wh)'].plot(title='Discharge_Energy(Wh)' , figsize=(20, 5))
```

```
Out[11]: <matplotlib.axes._subplots.AxesSubplot at 0x7f60b62c5890>
```




```
In [14]: current = df['Current(A)']
         voltage = df['Voltage(V)']
```

```
import numpy as np

df_soc = df[['Current(A)','Voltage(V)']]

# df_soc['SOC'] = pd.Series([soc_init], index=df.index)
df_soc = df_soc.assign(SOC=pd.Series(np.ones(len(df.index))).values)

df_soc
```

Out[14]:

	Current(A)	Voltage(V)	SOC
0	0.000000	3.471265	1.0
1	0.999713	3.619649	1.0
2	0.999893	3.625805	1.0
3	0.999893	3.630341	1.0
4	0.999713	3.633742	1.0
5	0.999893	3.636496	1.0
6	0.999713	3.638602	1.0
7	0.999713	3.640546	1.0
8	0.999893	3.642652	1.0
9	0.999893	3.644434	1.0
10	0.999713	3.646216	1.0
11	0.999713	3.647835	1.0
12	0.999713	3.649456	1.0
13	0.999893	3.651399	1.0
14	0.999893	3.653019	1.0
15	0.999893	3.654801	1.0
16	0.999713	3.656583	1.0
17	0.999893	3.658365	1.0
18	0.999893	3.659985	1.0
19	0.999893	3.661767	1.0
20	0.999893	3.663549	1.0
21	0.999713	3.665331	1.0
22	0.999893	3.666951	1.0
23	0.999713	3.668571	1.0
24	0.999533	3.670190	1.0
25	0.999713	3.671972	1.0
26	0.999893	3.673592	1.0
27	0.999893	3.675212	1.0
28	0.999893	3.676994	1.0
29	1.000073	3.678290	1.0
...	...	...	...
11584	-2.825607	2.871734	1.0
11585	-2.238079	2.935397	1.0
11586	-1.220837	3.086697	1.0
11587	0.273266	3.350581	1.0
11588	0.187071	3.406792	1.0
11589	0.075324	3.417484	1.0

```
11590   -0.744876    3.301336  1.0
11591   -0.618013    3.307977  1.0
11592   -0.622872    3.305223  1.0
11593   -0.912047    3.256626  1.0
11594   -2.152424    3.050897  1.0
11595    0.277944    3.404200  1.0
11596    1.407114    3.599400  1.0
11597    0.612467    3.517432  1.0
11598    1.615133    3.639250  1.0
11599    0.699021    3.538815  1.0
11600    0.106095    3.464623  1.0
11601   -1.022715    3.297772  1.0
11602   -0.679015    3.330980  1.0
11603   -1.569755    3.181624  1.0
11604   -2.678770    2.986424  1.0
11605   -3.999943    2.805155  1.0
11606   -4.000124    2.716708  1.0
11607   -4.000303    2.664385  1.0
11608   -4.000303    2.621133  1.0
11609   -2.531573    2.714926  1.0
11610   -4.000124    2.618703  1.0
11611   -3.017971    2.629556  1.0
11612   -4.000483    2.541433  1.0
11613   -4.000124    2.499477  1.0

[11614 rows x 3 columns]
```

In [16]:
```
# SOC calculation
for i in range(1, len(df_soc)):
    df_soc.loc[i, 'SOC'] = df_soc.loc[i-1, 'SOC'] + df_soc.loc[i-1, 'Current(A)']/7200

df_soc
```

Out[16]:

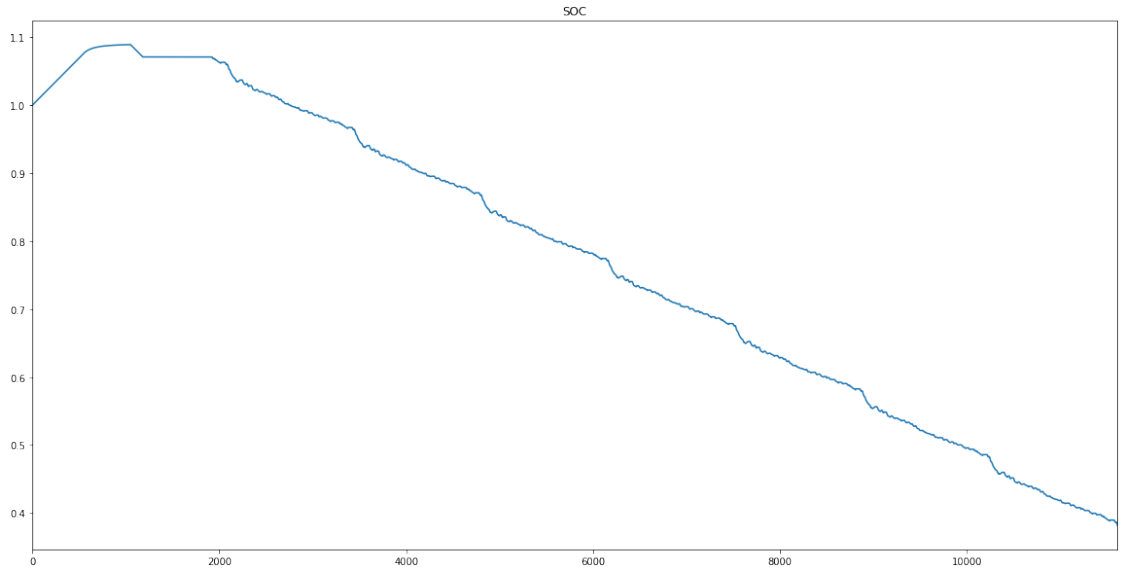
	Current(A)	Voltage(V)	SOC
0	0.000000	3.471265	1.000000
1	0.999713	3.619649	1.000000
2	0.999893	3.625805	1.000139
3	0.999893	3.630341	1.000278
4	0.999713	3.633742	1.000417
5	0.999893	3.636496	1.000555
6	0.999713	3.638602	1.000694
7	0.999713	3.640546	1.000833
8	0.999893	3.642652	1.000972
9	0.999893	3.644434	1.001111
10	0.999713	3.646216	1.001250
11	0.999713	3.647835	1.001389
12	0.999713	3.649456	1.001527
13	0.999893	3.651399	1.001666

14	0.999893	3.653019	1.001805
15	0.999893	3.654801	1.001944
16	0.999713	3.656583	1.002083
17	0.999893	3.658365	1.002222
18	0.999893	3.659985	1.002361
19	0.999893	3.661767	1.002500
20	0.999893	3.663549	1.002638
21	0.999713	3.665331	1.002777
22	0.999893	3.666951	1.002916
23	0.999713	3.668571	1.003055
24	0.999533	3.670190	1.003194
25	0.999713	3.671972	1.003333
26	0.999893	3.673592	1.003472
27	0.999893	3.675212	1.003610
28	0.999893	3.676994	1.003749
29	1.000073	3.678290	1.003888
...	...	...	...
11584	-2.825607	2.871734	0.387569
11585	-2.238079	2.935397	0.387177
11586	-1.220837	3.086697	0.386866
11587	0.273266	3.350581	0.386696
11588	0.187071	3.406792	0.386734
11589	0.075324	3.417484	0.386760
11590	-0.744876	3.301336	0.386771
11591	-0.618013	3.307977	0.386667
11592	-0.622872	3.305223	0.386581
11593	-0.912047	3.256626	0.386495
11594	-2.152424	3.050897	0.386368
11595	0.277944	3.404200	0.386069
11596	1.407114	3.599400	0.386108
11597	0.612467	3.517432	0.386303
11598	1.615133	3.639250	0.386388
11599	0.699021	3.538815	0.386613
11600	0.106095	3.464623	0.386710
11601	-1.022715	3.297772	0.386725
11602	-0.679015	3.330980	0.386583
11603	-1.569755	3.181624	0.386488
11604	-2.678770	2.986424	0.386270
11605	-3.999943	2.805155	0.385898
11606	-4.000124	2.716708	0.385343
11607	-4.000303	2.664385	0.384787
11608	-4.000303	2.621133	0.384231
11609	-2.531573	2.714926	0.383676
11610	-4.000124	2.618703	0.383324
11611	-3.017971	2.629556	0.382769
11612	-4.000483	2.541433	0.382349
11613	-4.000124	2.499477	0.381794

```
[11614 rows x 3 columns]
```

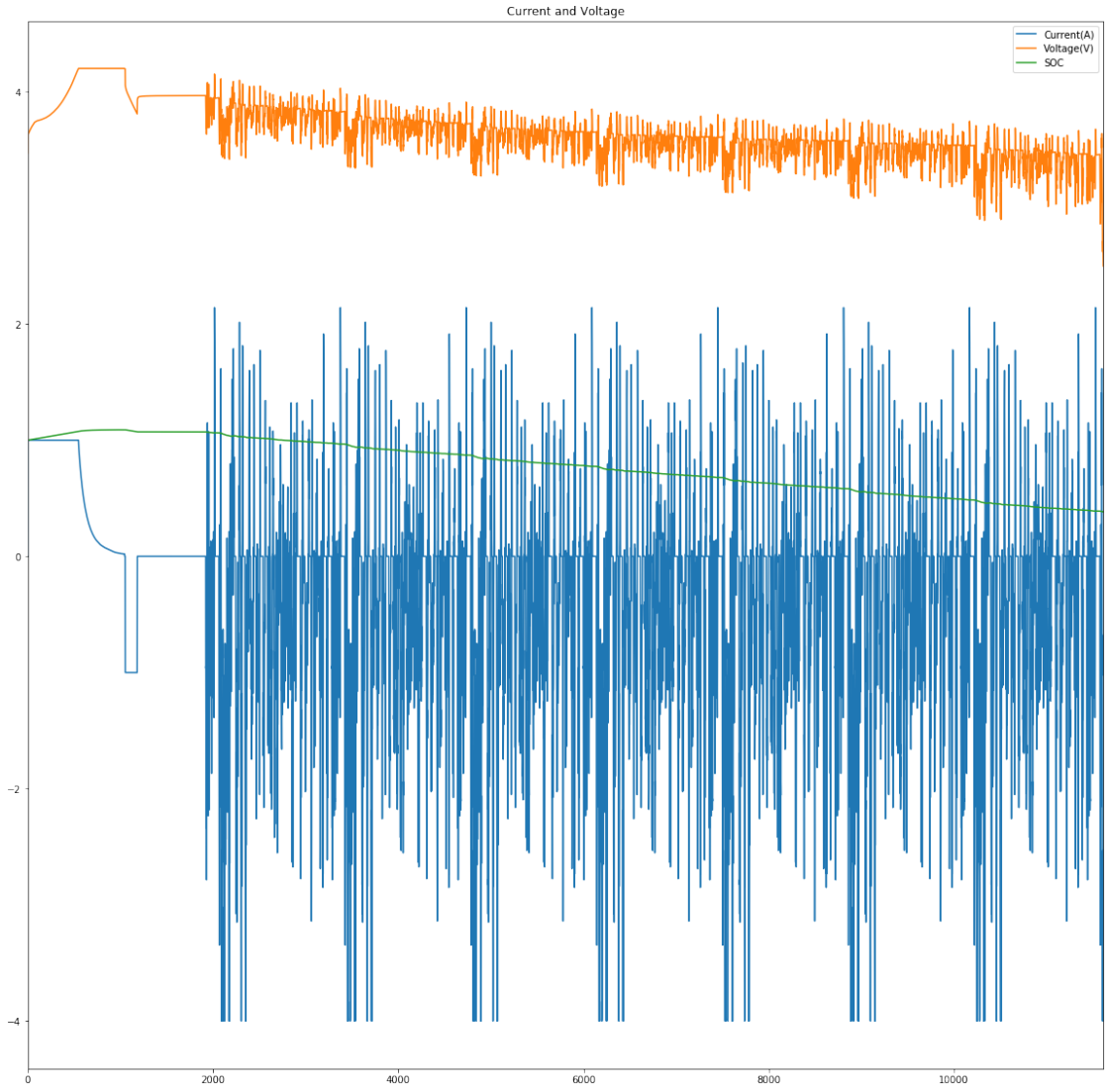
```
In [17]: df_soc['SOC'].plot(title='SOC' , figsize=(20, 10))
```

```
Out[17]: <matplotlib.axes._subplots.AxesSubplot at 0x7f60b61abfd0>
```




```
In [18]: df_soc.plot(title='Current and Voltage' , figsize=(20, 20))
```

```
Out[18]: <matplotlib.axes._subplots.AxesSubplot at 0x7f60b60cabd0>
```


Current and Voltage
Current(A)
Voltage(V)
SOC
4
2
0
−2
−4
0
2000
4000
6000
8000
10000