Using the Python POD API Setup_PodDevices Class

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1 Summary

The Setup_PodDevices class is used to initialize and stream data from 8206-HR and 8401-HR Data Conditioning and Acquisition Systems. The user can set up several devices and stream concurrently from one computer. Other POD devices will be supported in the future.

All of the required modules can be found here:
https://github.com/Pinnacle-Technology-Inc/Python-POD-API/tree/integration/Code/Modules

Example Python code can be found here:
https://github.com/Pinnacle-Technology-Inc/Python-POD-API/tree/integration/Code/Examples

Other documentation for Python POD API code can be found here:
https://github.com/Pinnacle-Technology-Inc/Python-POD-API/tree/integration/Documents

2 Class Setup

Setup_PodDevices requires Setup_8206HR, Setup_8401HR, Setup_Interface, and UserInput modules. You may also need to install these (https://github.com/Pinnacle-Technology-Inc/Python-POD-API/blob/integration/Documents/PyEnvRequirements.txt) libraries to your python environment.

First, create a new python file (*.py) or identify an existing file where you want to use an 8206-HR. To include the Setup_PodDevices class, write the following line of code to the top of your Python file:

```
from Setup_PodDevices import Setup_PodDevices
```

Next, you must create the Setup_PodDevices object and call Run() on the class instance. The initialization and usage of this class are described in Sections 3 and 4. Here is an example:

```
go = Setup_PodDevices()
go.Run()
```

After completing the first-time setup, the program can generate some initialization variables that can be used for the Setup_PodDevices constructor. You can pass a string containing the path and filename as a parameter. Note that only *.txt, *.csv, amd *.edf extensions are accepted at this time. If you set the saveFile parameter, it will skip the associated initialization steps. Here is some example code:

```
sf = r'C:\Users\tkelly\Desktop\TEST\test.csv'
go = Setup_PodDevices(saveFile=sf)
go.Run()
```

You can also give the Setup_PodDevices constructor a dictionary containing the parameters for all POD devices. If you set the podParametersDict, it will also skip the associated setup steps. Here is some example code:

```
ppd = {'8206-HR' : {1: {'Port': 'COM5 - USB EEG/EMG (COM5)', 'Sample
      Rate': 500, 'Preamplifier Gain': 100, 'Low Pass': {'EEG1': 40,
```

```
      'EEG2': 40, 'EEG3/EMG': 40}}}}
go = Setup_PodDevices(podParametersDict=ppd)
go.Run()
```

Also, you can set both saveFile and podParametersDict into one constructor. This will skip all the object initialization steps and go straight to the options menu. Here is some example code:

```
sf = r'C:\Users\tkelly\Desktop\TEST\test.csv'
ppd = {'8206-HR' : {1: {'Port': 'COM5 - USB EEG/EMG (COM5)', 'Sample
      Rate': 500, 'Preamplifier Gain': 100, 'Low Pass': {'EEG1': 40,
      'EEG2': 40, 'EEG3/EMG': 40}}}}
go = Setup_PodDevices(saveFile=sf, podParametersDict=ppd)
go.Run()
```

3 Initialization

When creating a class instance of Setup_PodDevices using no constructor parameters, you will be asked several questions to initialize the program. First, you will set up the POD parameters for all devices (Section 3.1); passing a correctly formatted dictionary to the podParametersDict parameter in Setup_PodDevices() will skip this step. Next, you will set up the file to save streaming data to (Section 3.2); passing a string containing the file path and name to the saveFile parameter in Setup_PodDevices() will skip this step.

3.1 Setup POD Device Parameters

You will be asked which POD devices you will be using. For each supported device, 8206-HR and 8401-HR, enter ‘y’ for yes or ‘n’ for no. Next, you will be asked to input the parameters for all the devices; see Section 3.3.1 for the 8201-HR and Section 3.3.2 for the 8401-HR setup.

After all the parameters for the POD devices are input, the program will print a table displaying the information. You will be asked if the parameters are correct. Type ‘y’ and Enter if the parameters are correct. This will move the program to the next step. If one or more of the parameters are incorrect, type ‘n’ and Enter. Then enter the device number of the POD device to be changed. You will then be asked to re-input all of the parameters of that device. The updated table will be printed to the terminal and you will be asked if it is now correct.

When the POD parameter setup is complete, the program will write the associated inputs to each of the POD devices. The connection status will be printed to the terminal.

3.1.1 8206-HR

First, you will be asked how many 8206-HR devices you will be using. Enter an integer number into the terminal and click Enter. The program will then print a header for the current device number. It will also display the available COM ports on your computer. Note that the POD devices must be plugged into the computer at this time. You will be asked to select a port from the available list. Type the integer number and click Enter. Next, you will be asked for the sample rate in Hz for the current device. Type an integer number between 100 and 2,000 and click Enter. Then you will be asked for the preamplifier gain. Type 10 or 100 and click Enter. After that, you will be asked for the lowpass in Hz for each of the EEG channels (EEG1, EEG2, and EEG3/EMG). Enter a number between 11-500 for each channel. These steps will repeat for each 8206-HR device.

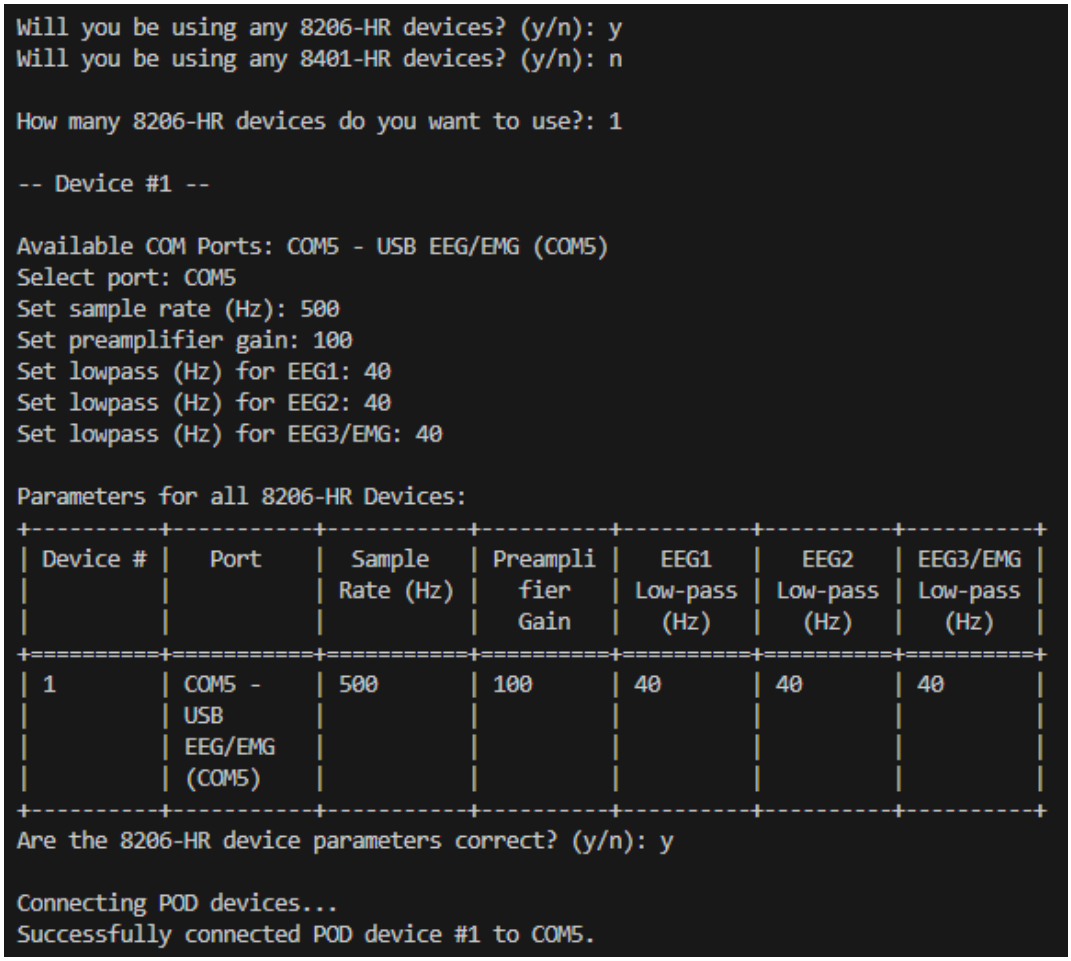

Figure 1. Example of the 8206-HR parameter setup for one device.

3.1.1 8401-HR

First, you will be asked if you will be using any 8206-HR devices. If you are, enter ‘y’ for yes and click Enter. Next, you will be asked how many 8206-HR devices you will be using. Enter an integer number into the terminal and click Enter. The program will then print a header for the

current device number. It will also display the available COM ports on your computer. Note that the POD devices must be plugged into the computer at this time. You will be asked to select a port from the available list. Type the integer number and click Enter. Next, you will be asked to input a mouse/rat preamplifier from a list; enter your desired option. Different preamplifiers will often have different channel names. Next, enter a sample rate between 2,000-20,000 Hz. Then you will be asked if you want to use mux mode; enter ‘y’ for yes or ‘n’ for no.

Next, you will be asked to input values for each of the preamplifier channels. First, enter the preamplifier gain; typically, this is 1 for biosensors and 10 or 100 for EEG/EMG. Then select 1x or 5x gain. Then enter your high-pass filter. For AC, enter 0.5, 1, or 10 Hz. For DC, enter 0. Next enter a frequency for the low-pass filter between 21-15,000 Hz. Next, set the bias voltage, which must be between +/- 2.048 V. Lastly, choose the DC mode; this is typically VBIAS for biosensors and AGND for EEG/EMG.

```
Will you be using any 8206-HR devices? (y/n): n
Will you be using any 8401-HR devices? (y/n): y

How many 8401-HR devices do you want to use?: 1

-- Device #1 --

Available COM Ports: COM6 - High Speed 8401 (COM6)
Select port: COM6
Available preamplifiers: 8407-SE, 8407-SL, 8407-SE3, 8407-SE4, 8407-SE31M, 8407-SE-2BIO, 8407-SL-2BIO, 8406-SE31M, 8406-BIO, 8406-2BIO, 8406-EEG2BIO, 8406-SE, 8406-SL,
8406-SE3, 8406-SE4
Set mouse/rat preamplifier: 8407-SE
Set sample rate (Hz): 2000
Use mux mode? (y/n): n
Set preamplifier gain (1, 10, or 100) for...
       Bio: 1
       EEG1: 10
       EMG: 100
       EEG2: 10
Set second stage gain (1 or 5) for...
       Bio: 1
       EEG1: 5
       EMG: 1
       EEG2: 5
Set high-pass filter (0, 0.5, 1, or 10 Hz) for...
       Bio: 0
       EEG1: 0.5
       EMG: 1
       EEG2: 10
Set low-pass filter (21-15000 Hz) for...
       Bio: 100
       EEG1: 200
       EMG: 300
       EEG2: 400
Set bias (+/- 2.048 V) for...
       Bio: 0.6
       EEG1: 0.6
       EMG: 0.6
       EEG2: 0.6
Set DC mode (VBIAS or AGND) for...
       Bio: VBIAS
       EEG1: AGND
       EMG: AGND

Parameters for all 8401-HR Devices:
+----------+--------------+--------------+--------------+----------+--------------+--------------+--------------+--------------+----------+-----------+
| Device # |     Port     | Preamplifier | Sample Rate  | Mux Mode | Preamplifier | Second Stage |   High-pass  | Low-pass (Hz) | Bias (V) |  DC Mode  |
|          |              |    Device    |     (Hz)     |          |     Gain     |     Gain     |     (Hz)     |               |          |           |
+----------+--------------+--------------+--------------+----------+--------------+--------------+--------------+--------------+----------+-----------+
| 1        | COM6 - High  | 8407-SE      | 2000         | False    | Bio: None    | Bio: 1       | Bio: None    | Bio: 100      | Bio: 0.6 | Bio: VBIAS |
|          | Speed 8401   |              |              |          | EEG1: 10     | EEG1: 5      | EEG1: 0.5    | EEG1: 200     | EEG1: 0.6 | EEG1: AGND |
|          | (COM6)       |              |              |          | EMG: 100     | EMG: 1       | EMG: 1.0     | EMG: 300      | EMG: 0.6 | EMG: AGND  |
|          |              |              |              |          | EEG2: 10     | EEG2: 5      | EEG2: 10.0   | EEG2: 400     | EEG2: 0.6 | EEG2: AGND |
+----------+--------------+--------------+--------------+----------+--------------+--------------+--------------+--------------+----------+-----------+
Are the 8401-HR device parameters correct? (y/n): y

Connecting POD devices...
Successfully connected POD device #1 to COM6.
```

Figure 2. Example of the 8401-HR parameter setup for one device.

3.2 Setup Save File

First, the program will ask for a directory path to create a save file for streaming data. Copy the path into the terminal and click Enter. If you want to save the file in the local directory, simply type the filename with the *.txt, *.csv, or *.edf extension now.

If a filename was not included in the file path, the program will ask you for a filename. Type the name of the save file and click Enter. If no extension is given, the program will default to *.csv. At this time, only *.txt, *.csv, or *.edf extensions are accepted. Note that the POD device number will be appended to the end of the filename, as each device will save streaming data to its own file.

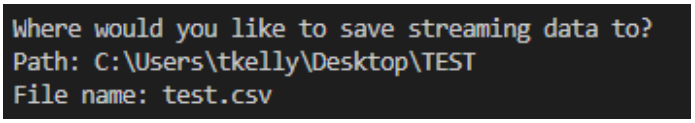

Figure 3. Example of save file setup.

4 Options

After the initial setup is complete, you will be presented with several different options (see Figure 4). To select an option, type the number into the terminal and click enter. Before you quit the program, run option 7 to save the current class configuration.

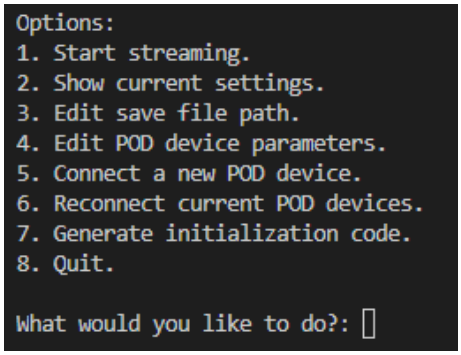

Figure 4. Options menu in the terminal.

4.1 Start Streaming

Option “1. Start streaming.” will concurrently read data from all connected 8206-HR devices. Streaming begins immediately after selecting this option. To stop streaming data, click enter when in the terminal. Then, the data (in uV) from each POD device will be saved to its own file. The device number will be appended to the end of the filename provided during setup. Lastly, the terminal will print the execution time of the total operation.

```
Press Enter to stop streaming:
Finishing up...
Save complete!

Execution time: 20 sec
```

Figure 5. Example of option "1: Start streaming."

Running option #1 a second time will overwrite the previous save. If you want to save the data to a new file, run option #3.

The computer will only stream data if all POD devices are properly connected to the computer. If there is a connection issue, check that all devices are plugged into the computer in the proper ports and attempt to reconnect by choosing option #6. If this does not fix the issue, there may be an issue with the device setup. Edit the devices as needed using option #3.

4.2 Show current settings

Selecting option "2. Show current settings" will print out a table describing the setup parameters for all POD devices and the file name and path that streaming data will be saved to.

```
Parameters for all 8206-HR Devices:
+----------+-----------+-----------+----------+----------+----------+----------+
| Device # |   Port    |  Sample   | Preampli |   EEG1   |   EEG2   | EEG3/EMG |
|          |           | Rate (Hz) |   fier   | Low-pass | Low-pass | Low-pass |
|          |           |           |   Gain   |   (Hz)   |   (Hz)   |   (Hz)   |
+==========+===========+===========+==========+==========+==========+==========+
| 1        | COM5 -    | 500       | 100      | 40       | 40       | 40       |
|          | USB       |           |          |          |          |          |
|          | EEG/EMG   |           |          |          |          |          |
|          | (COM5)    |           |          |          |          |          |
+----------+-----------+-----------+----------+----------+----------+----------+

Streaming data will be saved to C:\Users\tkelly\Desktop\TEST\test.edf
```

Figure 6. Example of option "2. Show current settings" for one 8206-HR device.

```
Parameters for all 8401-HR Devices:
+----------+--------------+--------------+--------------+---------+--------------+--------------+--------------+--------------+----------+------------+
| Device # |     Port     | Preamplifier | Sample Rate  | Mux Mode | Preamplifier | Second Stage |   High-pass  | Low-pass (Hz) | Bias (V) |  DC Mode   |
|          |              |    Device    |     (Hz)     |          |     Gain     |     Gain     |     (Hz)     |               |          |            |
+==========+==============+==============+==============+=========+==============+==============+==============+==============+==========+============+
| 1        | COM6 - High  | 8407-SE      | 2000         | False    | Bio: None    | Bio: 1       | Bio: None    | Bio: 100     | Bio: 0.6 | Bio: VBIAS |
|          | Speed 8401   |              |              |          | EEG1: 10     | EEG1: 5      | EEG1: 0.5    | EEG1: 200    | EEG1: 0.6| EEG1: AGND |
|          | (COM6)       |              |              |          | EMG: 100     | EMG: 1       | EMG: 1.0     | EMG: 300     | EMG: 0.6 | EMG: AGND  |
|          |              |              |              |          | EEG2: 10     | EEG2: 5      | EEG2: 10.0   | EEG2: 400    | EEG2: 0.6| EEG2: AGND |
+----------+--------------+--------------+--------------+---------+--------------+--------------+--------------+--------------+----------+------------+

Streaming data will be saved to C:\Users\tkelly\Desktop\TEST\test.csv
```

Figure 7. Example of option "2. Show current settings" for one 8401-HR device.

4.3 Edit save file path

Option “3. Edit save file path.” will ask the user for a path and filename to save streaming data to. It functions the same as the file setup (Section. 3.2), as shown in Figure 3.

4.4 Edit POD device parameters

Option “4. Edit POD device parameters.” will allow you to change any of the setup parameters of any connected POD device. First, a table displaying the current setup parameters will be printed in the terminal. Then, you will be asked which device you want to edit; input the number of the device in the terminal and click enter. Then, enter all the parameters of the device. The updated parameters table will be printed and you will be asked if everything is correct. If the answer is no, you will be asked again which device you want to edit. If the answer is yes, the devices will be reconnected. Then you will be brought back to the options menu.

4.5 Connect a new POD device

Option “6. Reconnect current POD devices.” will allow the user to connect one new 8206-HR device. The device number will be generated and displayed. Then you will be asked to input the device's setup parameters. Then, the updated parameters table will be shown and you will be asked if everything is correct.

4.6 Reconnect current POD devices

Selecting option “6. Reconnect current POD devices.” will attempt to reconnect all the 8206-HR devices. This is done by testing the cable connection to the device and then writing the setup parameters. The connection status, as success or failed, will be printed to the terminal. If the connection fails, check that all devices are plugged into their corresponding COM ports and attempt to reconnect.

4.7 Generate initialization code

Option “7. Generate initialization code.” will print out the code needed to setup and run the Setup_PodDevices class with the current setup parameters. The save file and POD device parameters, which are passed as parameters to the Setup_PodDevices constructor.

```
saveFile = r'C:\Users\tkelly\Desktop\TEST\test.csv'
podParametersDict = {'8206-HR': {1: {'Port': 'COM5 - USB EEG/EMG (COM5)', 'Sample Rate': 5
00, 'Preamplifier Gain': 100, 'Low Pass': {'EEG1': 40, 'EEG2': 40, 'EEG3/EMG': 40}}, 2: {'
Port': 'COM4 - USB EEG/EMG (COM4)', 'Sample Rate': 500, 'Preamplifier Gain': 10, 'Low Pass
': {'EEG1': 40, 'EEG2': 40, 'EEG3/EMG': 40}}}}
go = Setup_8206HR(saveFile, podParametersDict)
go.Run()
```

Figure 8. Example of option "6. Reconnect current POD devices."

4.8 Quit

Selection option "8. Quit." will exit the Setup_PodDevices program. If you want to save the current setup configuration, run option #7 before quitting.