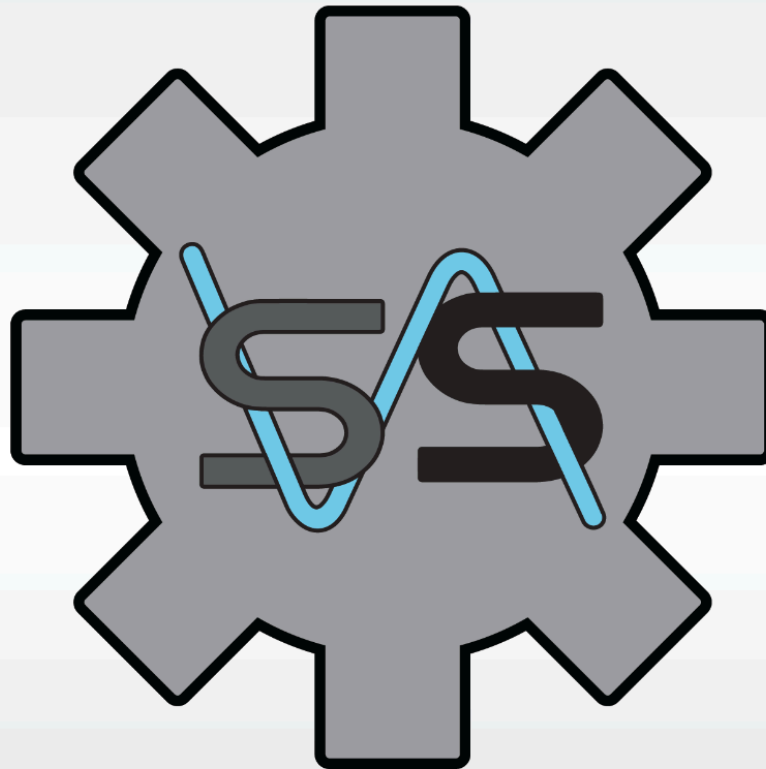


**SIGNALSOLUTIONS**



**Sensor Systems, Software, Sleep**



# Signal Solutions File Utility

## **USER MANUAL**

*August 2024*

# Signal Solutions File Utility

*Beta Version 1.0 – August 2024*

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## Contents

<b>Signal Solutions File Utility.....</b>	<b>3</b>
Update Header.....	5
Generate Accessory Files.....	6
Merge Files.....	7
Extract Data From File.....	10
<b>Activity Feature File Maker.....</b>	<b>12</b>
<b>Vigilance 3-State Maker.....</b>	<b>13</b>

## Signal Solutions File Utility

The **Signal Solutions File Utility** allows users to perform useful tasks on files created by the PiezoSleep systems. This includes:

- Editing header information
- Converting header formats
- Merging mouse (*binfb*) and rat (*bin*) files for recording separated by short interruptions
- Recomputing feature vector and feature parameter files from a bin/binfb pressure data file
- Extracting individual channels to a separate file

The files generated from this tool can be opened with SleepStats 4 and our Signal Quality Analysis Tool. **Merging and extracting features do not work with environmental files.**

When the program is installed and opened, a splash screen will appear. After a few seconds, the main user interface window will pop up, as shown in Figure 1. To open a file, click on the button labeled **Select** on the left side, and choose a *binfb* or *bin* file. The *Primary Bin(fb) File* box will display the header, start date, start time, duration, number of channels, and light and dark onsets of the chosen file, as shown in Figure 2.

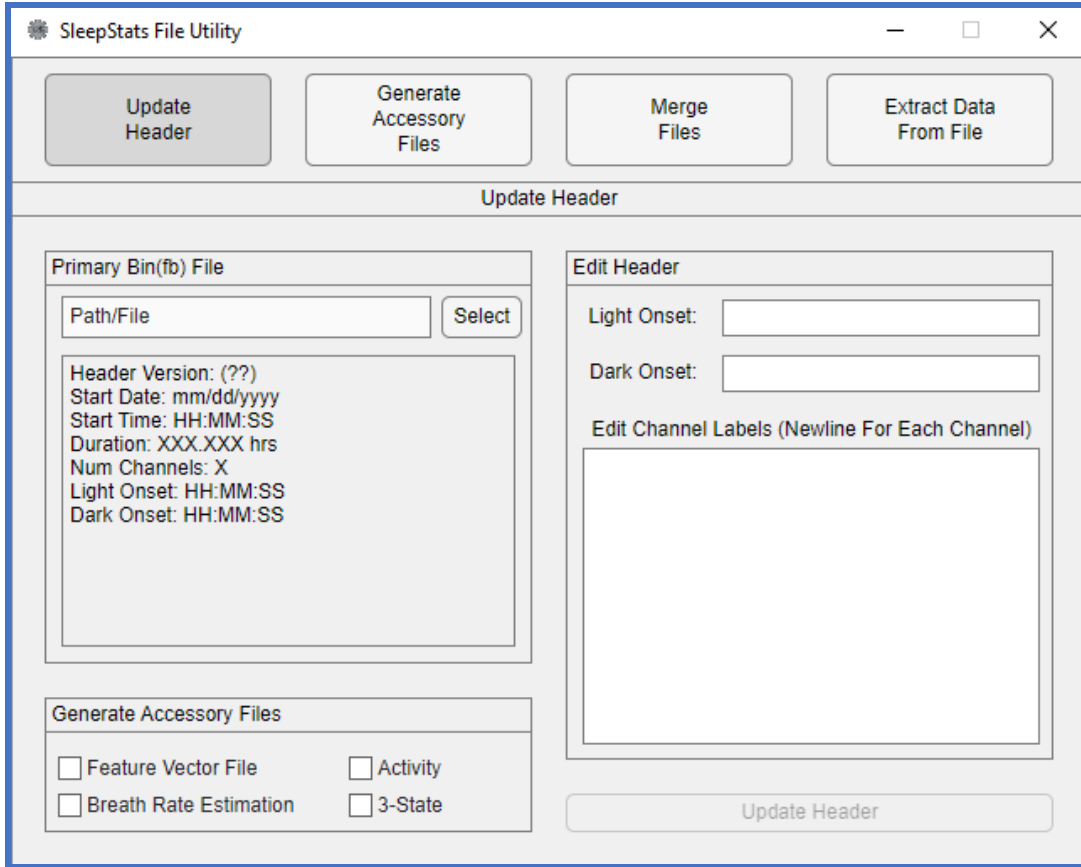


Figure 1: Main user interface window

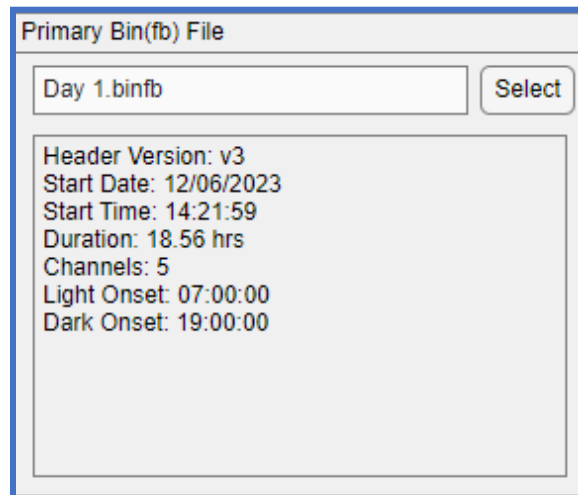
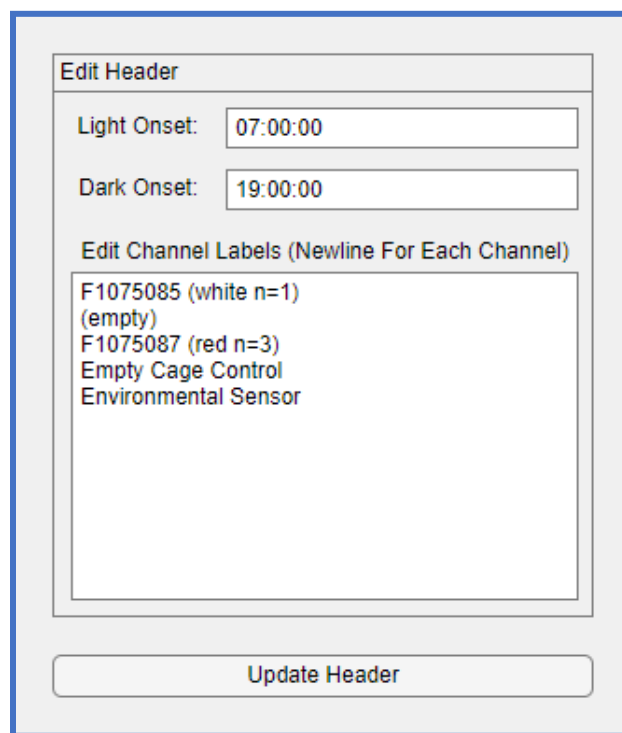


Figure 2: Example bin(fb) file selected

## Update Header

To the right of the *Primary Bin(fb) File* box is a panel labeled **Edit Header**, as shown in Figure 3 (be sure to have the *Update Header* tab selected at the top). Here you can edit the light and dark onsets and the channel labels for the selected bin file (may be useful in the case of errors made in inputting header information during start-up). Once you are done, click the **Update Header** button at the bottom. The file will be updated in the same location it was originally in when opened, preferably a folder.



The image shows a software window titled "Edit Header". It has a title bar with the text "Edit Header". Inside the window, there are two input fields for time: "Light Onset:" with the value "07:00:00" and "Dark Onset:" with the value "19:00:00". Below these is a section titled "Edit Channel Labels (Newline For Each Channel)" which contains a text area with the following text: "F1075085 (white n=1)", "(empty)", "F1075087 (red n=3)", "Empty Cage Control", and "Environmental Sensor". At the bottom of the window is a button labeled "Update Header".

Figure 3: Update Header tab with example bin file

After the task is completed, the window shown in Fig. 4 will appear, giving you three different options:

- **Re-Open Primary:** re-opens the bin(fb) file that was already opened
- **Open Different:** gives dialog to open an entirely different file
- **Close:** closes the application

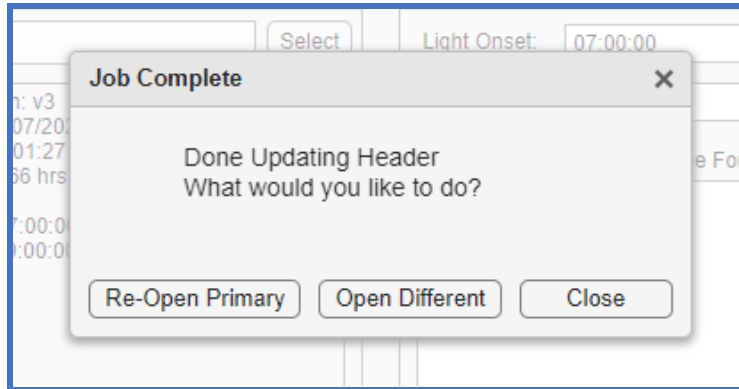


Figure 4: End of operation pop-up options.

### *Generate Accessory Files*

Below the *Primary Bin(fb) File* box, you have a selection of four different classification and estimation files you can generate for analysis in SleepStats, as shown in Figure 5. Although this box is present no matter what tab you have selected, it can only be used when the **Generate Accessory Files** tab is selected.

The **Feature Vector File** option creates a feature vector file (*FeatVecfb* for mouse and *FeatVec* for rat), which is needed for sleep-wake pattern analysis in any of the SleepStats versions. The **Activity** option creates an activity feature file (*\_at.Featfb* or *\_at.Feat*), which can be analyzed in Sleep Stats 4 Pro. The **Breath Rate Estimation** option creates a breath rate file (*\_br.Featfb* or *\_br.Feat*). The **3-State Feature** creates a file for 3-state analysis (*3s.wss* only for mouse), which can be analyzed in Sleep Stats 4 Pro.

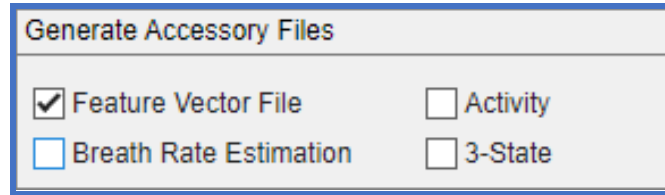


Figure 5: Panel to generate accessory files. Check as many boxes as you would like

You may select more than one at a time, however, the amount of time it takes to process all the files may take a while. This depends on how many files you selected, the number of hours recorded in each file, and/or the option(s) selected. For the **Feature Vector File** option, if your file contains a lot of data, specifically the number of hours recorded, this will affect the amount of time it takes to process the file. This may take about an hour or so. Once completed, you will get a message letting you know the action has been completed. If you check the folder the bin file is located in, you should see the additional file(s) in there.

After the task is completed, the same window shown in Fig. 4 will appear, giving you the same options.

### *Merge Files*

This feature allows you to combine multiple bin files separated by a short interval of time, as shown in Figure 6. To select a file, click on the **Select Additional File** button. If the bin file(s) you select does not have the same number of channels, a message shown in Fig. 7 will tell you that the files cannot be combined. Also, if the number of hours between the files exceeds 24 hours, you cannot merge the files, as shown in Figure 8. To remove files, highlight the file(s) and click the **Remove File(s)** button. **PLEASE NOTE: The gap in the decision statistic, breath rate, activity, and especially REM does not necessarily line up with the gap between concatenated files.**

Before exporting the new file, a name must be given to it. To do this, click on **Pick** in the box labeled *Output File* to create a new file name. If you use a file name that already exists in the designated folder, a message shown in Fig. 9 will pop up letting you know and asking if you would like to proceed. If you try to give it the same name as the chosen bin file, a message shown in Fig. 10 will pop up letting you know you are unable to do this.

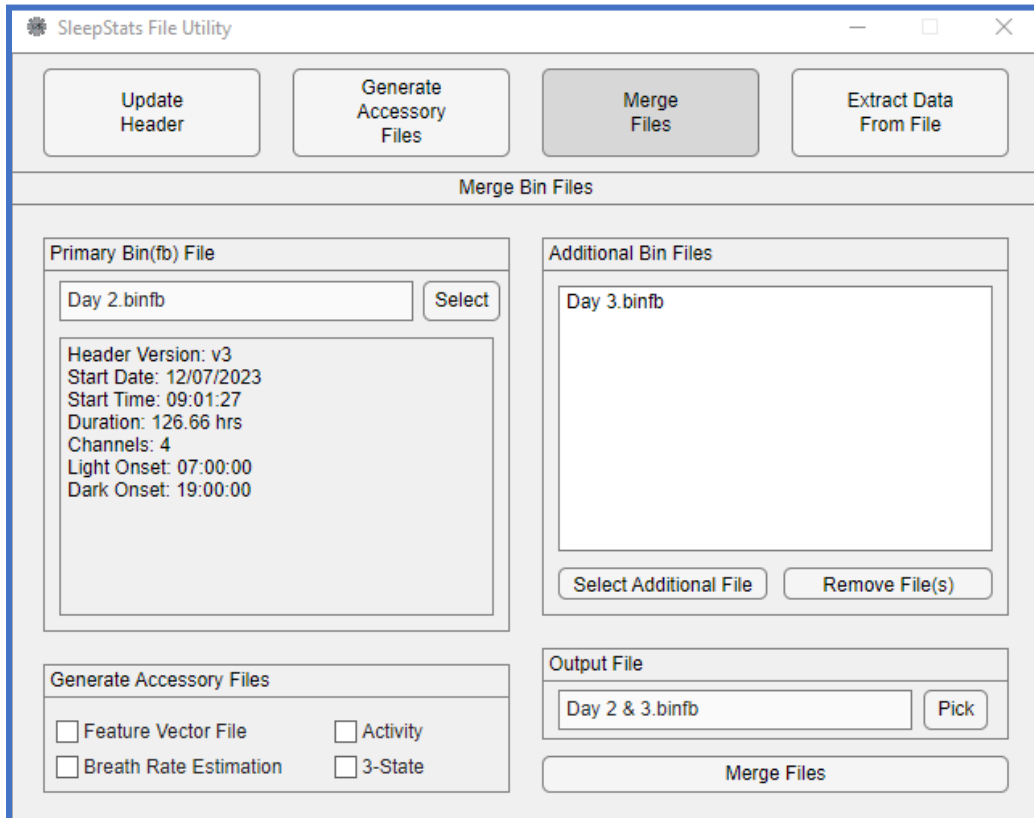


Figure 6: Merging two bin files



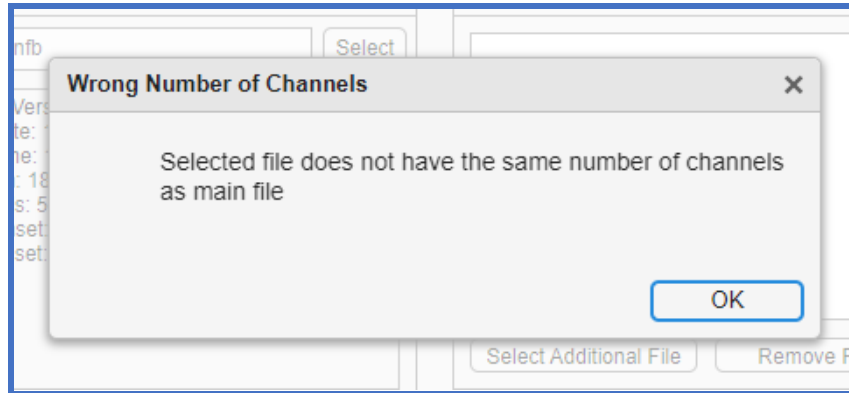


Figure 7: Appears if selected files do not have the same number of channels

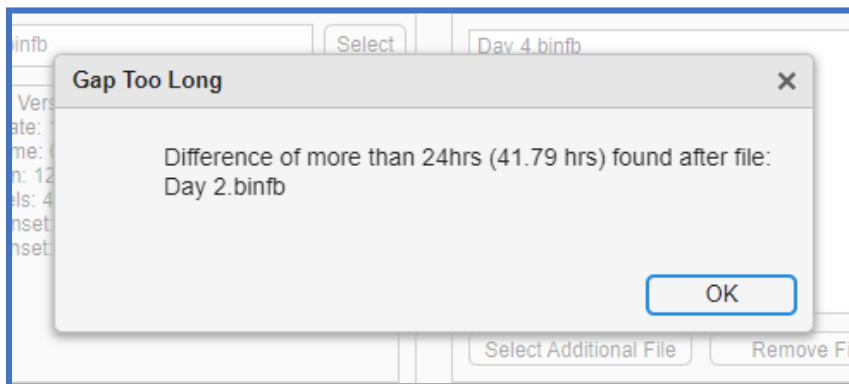


Figure 8: An example of when the selected files are more than 24 hours apart

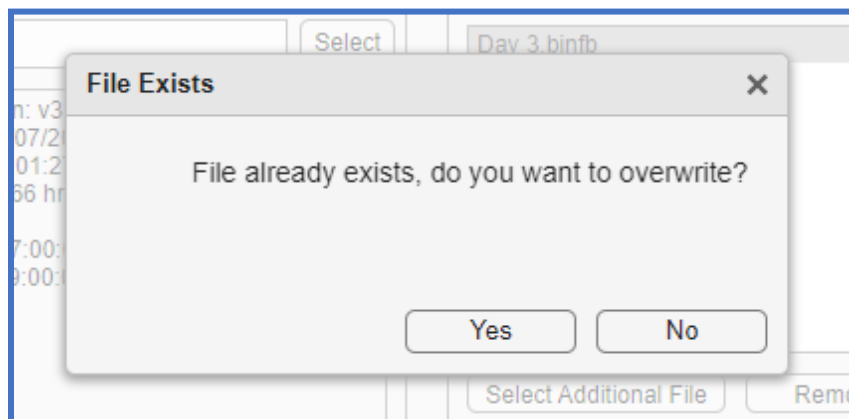


Figure 9: Appears if there is a file with the same name.

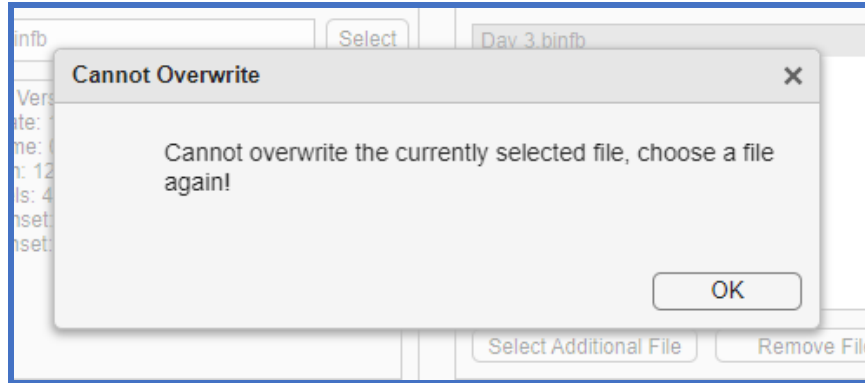


Figure 10: Appears if you try to name the output file the same as the chosen bin file.

After the task is completed, a window similar to Fig. 4 will appear, but this time, you have one additional option as shown in Fig. 11:

- **Open Output:** opens the file you just made (the file will appear in the *Primary Bin(fb) File* box)

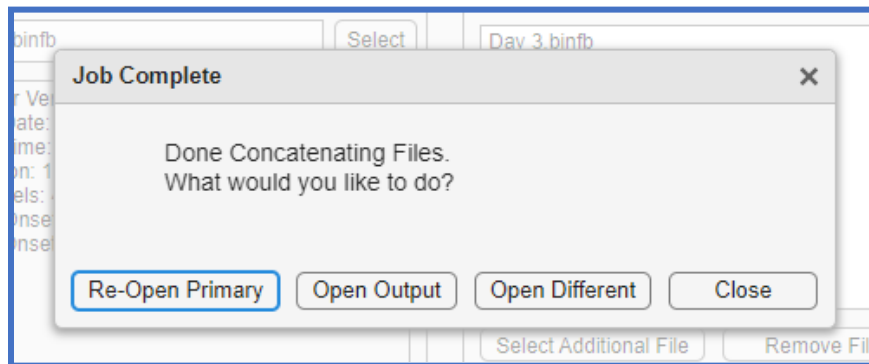


Figure 11: End of operation pop-up options for merging files.

## Extract Data From File

Each PiezoSleep recording combines all the channels into one file for the entire recording. If you wish to create a file with a subset of these channels for a limited time interval, new set files with selected channels in time limits can be created with this feature. With this tab selected, enter the channel(s) you want to extract data from, and now you can extract from one hour to another, as shown in Figure 12. Before exporting, give the output file a name, which can be done in the **Output File** box. If you do not, the file will not appear in the folder. Also, be sure to give it a name that does not already exist, or else it will be replaced. If you try to give it the same name as the selected file, the same message from Fig. 10 will appear.

Once finished, click on the **Extract Data** button on the bottom right side of the interface. The file should be in the same location as the original bin file, preferably in a folder. Also, the same window shown in Fig. 11 will appear, giving you the same options.

Extract Segment	
Extract From Hour:	<input type="text" value="0.0"/>
To Hour:	<input type="text" value="19.0"/>
Channels:	<input type="text" value="1,2,3,4,5"/>

Figure 12: Extract from the chosen bin file

## Activity Feature File Maker

Along with our File Utility program, we also offer two separate applications for creating activity feature files and 3-state files separately.

Click on the icon to open the application. While loading, a splash screen will appear. After a few seconds, a window will pop up, allowing you to open a *binfb* file. Once you select one, a window will appear indicating a file was added to the list. Click OK to dismiss this message. After this, the window before the last one will reappear, which allows you to select another file to add to the processing list. When you are done, click on **Cancel**. After this, a box shown in Fig. 1 will appear on and off while the files are processing.

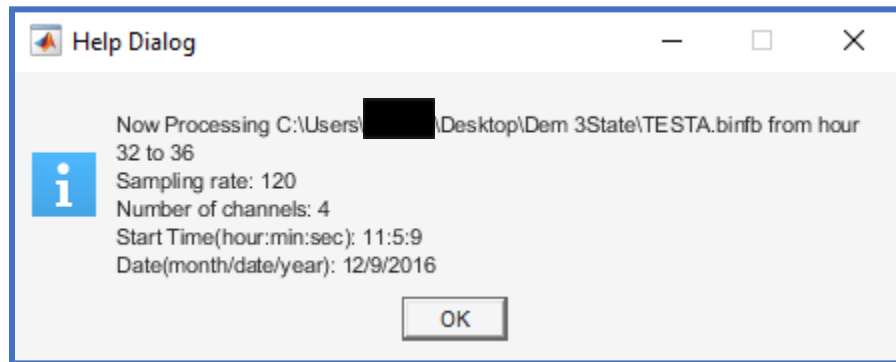


Figure 1: Appears while files are processing

Depending on the file size and the number of files selected, processing the file(s) may take several minutes. Once completed, you should see a new **at.Featfb** file in the folder(s) where the *binfb* file(s) was located.

## Vigilance 3-State Maker

This program creates 3-state files for 3-state analysis in Sleep Stats 4 Pro. It extracts additional features from bin files (*binfb*) generated by PiezoSleep recordings to score intervals such as Wake, NREM, and REM. The resulting file ends with a **3s.wss** string.

Click on the icon to open the application. While loading, a splash screen will appear. After a few seconds, some instructions will appear, as shown in Figure 1. After clicking OK, a window will pop up, allowing you to open a *binfb* file. After this, the same window will reappear, allowing you to select another file to add to the processing list. Once you have selected all the files you want to use, click on **Cancel**. While the files are loading, a box shown in Fig. 2 and 3 will appear.

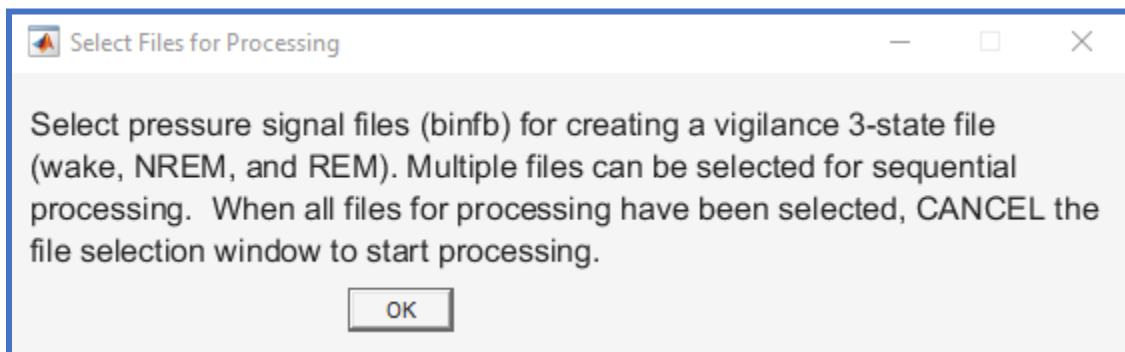


Figure 1: This window appears after the splash screen

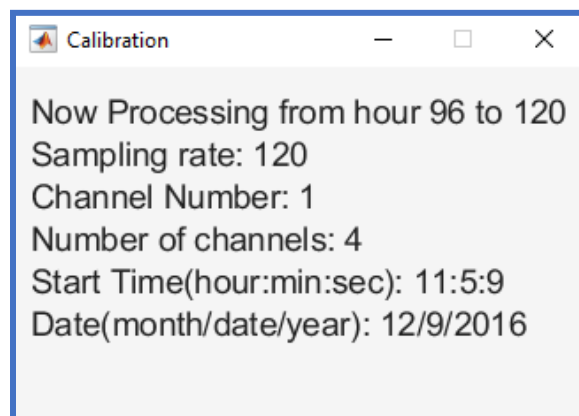


Figure 2: Calibration window appears while processing files

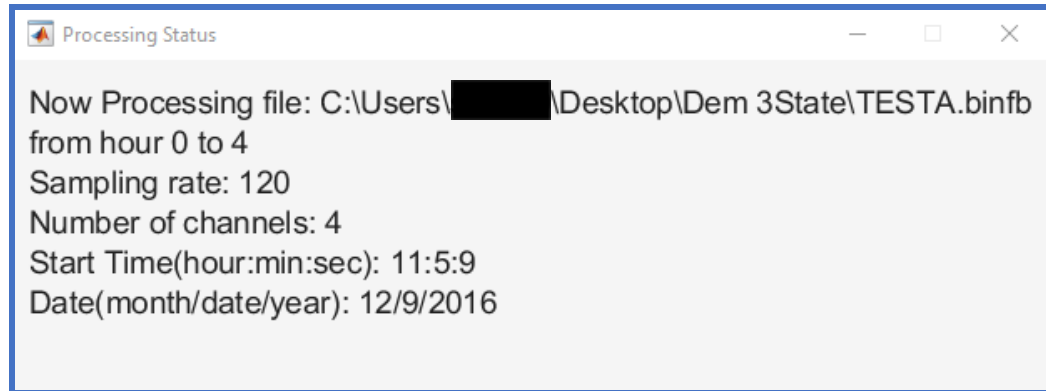


Figure 3: Appears sometime after the calibration window

Depending on the file size, this process may take a while and you may have to keep your computer running for a long time. Once completed, you should see a *3s.wws* file in the folder(s) the *binfb* file(s) was located.